PREFACE.

Consumption, scrofula, and all other tuberculous diseases have for many centuries been deemed incurable, but medical researches within the last thirty years have clearly established the fact by post-mortem examinations, that though they are incurable by man, yet Nature has cured them in a vast number of cases by a mysterious process of her own; that process the author has undertaken to elucidate in the following pages.

As it is Nature's process that is unfolded, it is almost needless to say that no quack nostrums will be found included in her plan of treatment of those diseases, hence this treatise will not be found an advertising sheet for cough syrups, balsams, pectorals, &c., but on the contrary it will clearly develop Nature's successful plan of treatment without medicines, so that the afflicted can be cured, and all predisposed to those diseases, enabled to ward them off.

No apology for the appearance of this treatise is deemed necessary, since, according to Professor Gross, nearly one-third of the deaths are caused by tuberculous diseases, and as nearly all the living are deeply interested in the subject through ties of kindred and friendship to the afflicted, it is presumed anything calculated to be of service in curing, or preventing those terrible diseases, will be acceptable.

The views presented will be found of service not only to the suffering but to others, since the propositions presented, and proved, will, if acted upon, enable all persons liable to suffer from those diseases to avoid that liability and live to a ripe old age. The attention, therefore, of all persons interested is earnestly solicited by

THE AUTHOR.

ASSIMILATION, CONSUMPTION,

AND

SCROFULA.

Dear Doctor:—*Can consumption be cured? is a question often asked with a tearful eye and a trembling tone, and almost all have felt their hearts shrinking to the size of a nutshell, from mortification at being compelled to acknowledge consumption and scrofula were still opprobria of the healing art. The attention of all who have been thus mortified, is earnestly requested, for I propose to show that they can be cured and prevented with certainty: and my thanks will be due to any one who will point out my illogical conclusions.

From past failures by others the attempt may appear futile, nevertheless I shall make it and shall do so the more willingly, from the fact that the cases reported are not from my own practice, but have been reported by others, and of course there can be no room for the slightest suspicion that the cases were manufactured to suit some favorite theory, or to promote selfish ends, and it is hoped therefore that the views presented, will be considered worthy of unusual confidence.

†"The writings of Laennec, Andral, Cruveilhier, Stokes, Williams, and others, prov that many cases of pulmonary

*These letters were addressed to Prof. W. K. Bowling, Editor of the Nashville Journal of Medicine and Surgery: considerable additions and emendations have been made and they are now presented in a more permanent form.

†Braithwaite's Retrospect, part 16, page 141, 1848.

phthisis have, contrary to all expectation, recovered: and that at a subsequent period, death having occurred from some other malady, the lungs have been found puckered and cicatrized from the healing of the tubercular cavern. The more recent researches of Rogee and Boudet, in Paris, and of J. Hughes Bennett, in Edinburgh, have shown from the indiscriminate examination in large hospitals, that puckerings, cicatrices, cretaceous concretions, and other evidences of former tubercle in the lungs, occur in at least one-third of all the individuals who die after the age of forty in this climate. Facts therefore, indicate that so far is pulmonary tubercle from being necessarily fatal, *that it is spontaneously cured by nature in a vast number of cases*, and that in not a few, this is accomplished, even when large ulcers have been formed in the lungs, and all those symptoms present which are considered evidences of, so called, consumption. The curableness of (understanding from that term recovery from) phthisis pulmonalis is a matter therefore, which no longer admits of dispute. It is a fact as certain as the curableness of pneumonia, or the union of a fracture, and like the latter, is susceptible of demonstration by means of well preserved preparations."

According to the indisputable facts reported by the above authorities, Nature has cured pulmonary phthisis, it becomes therefore a matter of vital importance that the true rationale of her mode of procedure be pointed out, in order that suffering thousands may be relieved, and what is of still more importance, that tens of thousands may be taught to live in such a way as to prevent effectually the development of the disease.

Perhaps the best plan for me, as this is a tiresome subject to many, will be to present my proposition in the broadest terms and afterwards the proof, and if the reader is a little drowsy, he may be aroused to examine the reasoning which led me to my conclusions.

1. Consumption and scrofula are caused by impurity of the blood.

2. That impurity of the blood is not utterly inexplicable,

and unmanageable, but is caused by neither more nor less than unassimilated chyle in the blood.

3. Assimilation is a physiological process, and cannot be assisted otherwise than by attention to physiological laws.

4. Good food and healthy digestion are two essential requisites for the furnishing of healthy chyle.

5. A third physiological law to be attended to is, that respiration plays a very important part in the assimilative process; and the function of respiration is not "solely to eliminate carbon from the blood" as ordinarily maintained.

6. Perfect respiration is absolutely essential to perfect assimilation, and tuberculous depositions occur because respiration fails to put the finishing touch to the assimilation of the chyle.

7. According to the laws of heat, one thousand degrees of heat become latent upon the conversion of water into vapor.

8. In consequence of that law, a full healthy action of the skin is necessary to keep up a proper equilibrium of temperature, and as the temperature is exactly in proportion to the respiration, it must be equally necessary to perfect respiration.

9. So long as we regard those diseases as pathological, to be remedied by officious intermeddling, they will be opprobria of the healing art, and conversely, whenever we strike at the true cause of the impurity of the blood, viz: imperfect assimilation, to be remedied by careful attention to *physiological processes*, the practice will be successful. I was led to examine the effect of respiration on assimilation, by the following fact; being compelled to lead a sedentary life temporarily, diarrhœa came on slightly, though the pains were severe; feeling weary and exhausted by my confinement, I concluded to try the exhilarating influence of full respiration of pure fresh air, for the purpose of relieving those feelings, when lo and behold! Dame Nature gave me more than I bargained for, the diarrhœa was cured too, even severe pains were promptly relieved. Three times did I cure myself in this manner, and the results were so prompt and effective, there could be no mistake.

How was that curative influence exerted? was the first point to be settled: it could not be on the digestion, for that process was already accomplished, neither could it be on the process usual in the intestines, for that was also accomplished; furthermore, the situation of those organs precluded the idea of any direct action of respiration on the results to be accomplished in the stomach and intestines; there remained then, no other conclusion than that the process of assimilation was regulated and finally finished in the lungs. It was clear to me then, that my sedentary life and imperfect respiration had failed to put the finishing touch to assimilation, and my system finding the unassimilated chyle circulating through it with the blood, had thrown it out through the bowels.

The anatomical structure, was also sufficient to show it was intended by the Creator, that respiration should have some influence over the chyle; the thoracic duct empties into the venous system, and the whole of the chyle is passed through the lungs before it is sent out to nourish the body; now had it been ready without any additional step, for the nourishment of the body, the arterial system would have been the proper place for the termination of the thoracic duct, so that the chyle could have gone directly on its mission of nourishment. I was compelled then to reject the common idea, that the office of respiration was *solely* to eliminate the carbon of the blood, as altogether erroneous and calculated to be a bar to any further actual progress in the investigation of physiological phenomena. While on the watch for facts to lead me to a clear understanding of the connection of respiration and assimilation, the following, concerning which I was not likely to be mistaken, fell under my notice; my wife laid her infant across her bosom to quiet it, and inadvertently dropped asleep and slept the greater part of the night with it in that position; diarrhœa resulted, and as her system was in a healthy condition, and food wholesome, I could not come to any other conclusion, than that respiration being so imperfectly performed, was the cause of the diarrhœa, especially as she was promptly cured by sponging the whole

body with warm water and a coarse cloth to arouse the skin, and by voluntary forced respiration as in my own case.

Of course, no one with irritable stomach and bowels, or who had partaken of indigestible food, or gorged down too much, could rationally expect to be cured as promptly.

While investigating this subject, the remarks of Prof. Eve, in his letters from Europe, came to my mind. "Few drunkards present tubercles. In 1839 I think it was, of all who died in the New York Hospital submitted to a careful post-mortem examination, no tuberculous matter was found in any one who habitually used alcoholic drinks." (He also mentions an exception to the rule, all rules have exceptions.) Drunkards breathe much more frequently than others, was the instant thought, and there was but one more step for me to take: having decided that free respiration was essential to perfect assimilation, and the drunkards who breathe freely being exempt from tuberculous depositions, the conclusion was unavoidable that tuberculous depositions resulted from imperfect assimilation, or as worded in my proposition, from unassimilated chyle. This was further confirmed by the fact, that tubercles are composed of unorganized matter; they are unorganized, simply because it would be impossible for an organized product to be, deposited from unorganized constituents of such a fluid as unassimilated chyle; it would be a great stumbling block in the way, if tubercles were composed of organized matter; but as they are not thus composed, no better proof could be asked, that they resulted from unorganized constituents.

Again, the following statements are made in most works on Practice. 1st That tubercle consists of an animal matter, mixed with certain earthy salts. 2nd, That the relative proportion of these, varies in different specimens of tubercle. Now when we recollect that the chyle constantly varies with the quality of the food, the condition of the nervous system, and the digestion, and then again is varied in proportion to the perfection of respiration, we see clearly the cause of the variations in tubercles, and the facts all harmonize with the laws of cause and effect.

Now whether alcohol has any effect on the system by being so readily absorbed into the blood, and thereby perhaps aiding the combustion going on in the lungs, as is supposed by some, is a matter of minor importance; for no physician would recommend any one to become a habitual drunkard for the purpose of avoiding any tendency to tuberculous depositions; but one thing is a matter of importance, and that is, the respiration of a drunkard is far more frequently and fully performed, than the respiration of a sober man.

I shall assume for the present, that the purification of the blood of the drunkard, so as to prevent the deposition of tubercles, is owing to the chemico-vital effects of respiration, instead of the admixture of the poisonous alcohol, and will show in the proper place, that the same results can be accomplished without the use of alcohol.

Now, how is the change effected? There are only two plans for securing purity of blood; the impurities must be either thrown out, or prevented from entering — there is no third plan: and we must necessarily conclude the impurities are thrown out by an eliminating process, or kept out by a perfectly assimilating process. In the first place, then, if the impurities were eliminated, they would be there to speak for themselves, and be as readily found as the carbon, but as they are not found, no alternative is left us, but to say that the process is one of perfect assimilation.

In asserting that the purification is effected by a more perfect process of assimilation, I do not mean to assert that every particle of the chyle is perfectly assimilated and changed to healthy blood; an objector may urge, that it is not altogether a process of perfect assimilation, that it ought still to be called an eliminating process, as it may be, and probably is the case, that a portion of the carbon of the chyle is eliminated at once without going the rounds of the circulation. Whether the chyle be perfectly assimilated by eliminating a portion of its carbonaceous matter, before entering into the general circulation, or whether every particle of the chyle is perfectly assimilated

without the elimination of any carbon, is a matter of no importance as far as the final result is concerned, and I shall not dispute about the name, when the final result in either case, is perfect assimilation of the chyle, and consequently purity of blood.

Though the lungs cannot be considered in this respect an *eliminating* organ, yet as that condition of the blood resulting in tuberculous depositions is got rid of, it is more convenient sometimes to speak of the lungs as an eliminating organ, than to use a roundabout phrase for the purpose of truly indicating the whole process. I mention this to prevent any unnecessary criticism.

Another fact familiar to us all is, that if in a consumptive family, there is a drunkard, he will be able to lie out all night on the ground without taking cold, or experiencing any other injury, while his sober brother who carefuly houses himself, takes cold easily, and becomes subject to the disease; as before specified, the most striking point of difference between the two is in their respiration—the one breathing freely the pure, fresh air of heaven, the other the dry, vitiated air of a close chamber.

Let us examine the process of respiration carefully, and we will be prepared to put a proper interpretation on another curious and indisputable fact: let any one double himself over, as a tailor, or shoemaker, and watch the inflation of the lungs, and it will be perceived that as ordinarily performed, the lower part of the lungs executes the main duty of respiration, while the upper part of the lungs is but slightly used. Now, if the view presented that tubercles are caused by unassimilated chyle, and that perfect respiration is necessary to perfect assimilation be correct, we should naturally expect that part of the lungs where respiration is most perfect, to be free of tubercles, and, *vice versa*, where the respiration is most imperfect, we should certainly expect to find tuberculous depositions. Accordingly, we find that all works on Practice tell us that tubercles are nearly always found in the apex of the lungs first, while the base is generally free from them. No satisfactory explanation

of this fact is given in any work I have seen; a late writer in the Nashville Journal says, it is because "nature has so arranged it." Being more a student of nature than of man, I have interrogated nature why she so arranged it, and the reply is, the impurity of the blood resulting in tuberculous depositions is caused by unassimilated chyle; perfect respiration is absolutely essential to perfect assimilation, and as the upper part of the lungs is not so greatly used as the lower in ordinary respiration, therefore, the necessary changes can not, and do not take place in the blood there, and the necessary consequence is, that tubercles are deposited at that point, while in the lower part, the more perfect respiration puts the finishing touch to the assimilation of the chyle, and there being no unorganized matter in the blood in that part, of course no unorganized tubercles will be deposited.

Instead, then, of saying, "It is a curious circumstance to be borne in mind as a means of diagnosis, that tubercles are deposited nearly always in the upper part of the lungs first," let us say: It is a curious circumstance to be borne in mind as a means of *prevention;* let us say to all interested, "if you wish to prevent the deposition of tubercles in the upper part of your lungs, see to it as you value your lives, that respiration be as perfectly performed there as in the lower. Learn a lesson from nature, follow her plan to purify the blood, and you will succeed far better than if you were to try infusions of every plant from Greenland to Cape Horn, in search of that vegetable remedy of which Dr. Rush prophecied.

The next important fact, bearing on this subject, is one so familiar to all, it will not be necessary to dwell on it at length; it is, that those who lead active, energetic lives, especially out-door lives, are less liable to tuberculous diseases, and live longer than those who lead a sedentary in-door life. The prescription, "Take plenty of exercise and keep your blood circulating," is in every one's mouth, whether doctor or patient; let us, however, not be satisfied with the vague explanations of the fact commonly given; but let us take one step further with the

above view in our mind, and we will see clearly that the phrase exercise "promotes health by promoting digestion," should be, exercise promotes health by promoting assimilation; for while we are exercising actively, respiration is frequent and full, and as a matter of course, assimilation is more perfect.

Another important fact, showing the influence of respiration in purifying the blood, is that the larger the lungs the purer the blood, or in other words, when we see a man with a large capacious chest, we say, "he'll never die of consumption," but when we see a man with a small, flattened chest, breastbone and backbone almost touching, we say, without hesitation, he is of a "consumptive make." If the views above presented are not correct, is it not an astonishing circumstance, that in every case, without any exception whatever, just precisely in proportion to the respiration is the purification of the blood, and the vigor of life. If they are correct, there is no extraordinary coincidence about it, everything is in harmony with the laws of cause and effect. Cuvier, who took a more extended view of the animal kingdom than any other man has ever done, found from his immense survey that, without any exception whatever, vigor of life was in the ratio of the consumption of oxygen, and the conclusion, therefore, is irresistible that those who desire vigor of life must so use their lungs as to consume a large amount of oxygen. In the capacious chest, respiration is performed on such a scale as to perfectly assimilate all the chyle thrown into the blood, hence we see men with chests like Thomas H. Benton's, for instance, living to a good old age, while thousands with narrow, contracted chests are laid prematurely in the grave; hence all persons of a consumptive tendency, instead of expanding their stomachs with cough syrups, and balsams, should expand their lungs with the purifying air of heaven. The same means of purification of the blood are used by nature with other animals. No farmer ever saw a "measly hog" filled with "kernels," *alias* tubercles, which had been ranging wild in the woods, while such hogs are quite frequent in the home stock after they have bee confined several months in the fattening pen.

What is the standing rule with every good farmer, when he finds a diseased hog in his fattening pen? "turn him out and let him run," invariably is the cry; in other words, let him take that exercise so necessary, of course he will breathe oftener and more freely, the blood will soon be purified, and the system being able to manage properly all the food taken into it, he will therefore recover.

In the large dairy establishments of London, where from one hundred to two hundred cows are kept constantly in their stalls all the time, they frequently become liable to tuberculous disease, and if continued in confinement, the disease will run through the various stages just as in man. Hence, we have negative proof of the correctness of the views advanced, namely, the production of tubercuIous disease when the lungs are only moderately used. Will any one say it is a mere coincidence?

The owners of the dairies watch, and when symptoms of disease appear, the cows are killed and thrown into the market before they fall off much, and it is mentioned as a singular circumstance, that the meat of these tuberculous cows is *sweeter* than ordinary beef; so that when your gratified palate causes you to exclaim, "this is the sweetest beef I ever ate in my life," you can gratify your mind also, with the comforting assurance that it is extremely probable it was some old stall-fed consumptive cow, and you can pass a pleasant hour while digesting it, in speculations as to which of the various stages she was in.

This view of consumption, and scrofula, would render food a very important item, for it is self-evident, nature cannot cure or prevent those diseases by eliminating tuberculous matter, if man continues to throw it in faster than it is thrown out; it would be extreme folly for a man to chew up tuberculous matter which a hog's stomach and lungs had failed to assimilate, and calculate his own system could manage it properly.

Another strong negative proof of my position is the following fact: — While I was studying medicine, a relative brought a small monkey from South America. As long as it was allowed

to play about the house, it kept in fine health, but finally its depredations became so annoying, that a cage was procured and it was confined. Now, mark the result—in a short time a regular hacking cough supervened, so much like that of a man, that I watched the progress of the case with considerable interest. The cough grew worse, hectic fever, and profuse sweating came on, and a wasting diarrhea closed the scene. I made a post-mortem examination, and found the lungs and bowels thickly studded with tubercles, exactly like those of a human being. As long as the monkey could play and take plenty of exercise, its stomach and lungs could keep the blood pure, but when it was confined so that it did not use its lungs freely, impurity of the blood resulted, and tuberculous depositions followed, causing the development of a clear case of consumption.

In this case we see plainly that imperfect respiration resulted in tuberculous depositions; the converse will hold good, that perfect respiration will prevent tuberculous depositions, as for instance, in the base of the lungs, ergo, it is entirely unnecessary for consumptive patients to become drunkards in order to prevent tubercles, for the same result can be accomplished without the use of alcohol. In fact, the habitual use of alcohol will retard the process of purification, for it will tend to derange the stomach. Almost every one has seen colored plates representing the coats of the stomach and intestines of a drunkard, and it is very evident such a stomach could not perform the process of digestion in a healthy manner. The chyle, therefore, must necessarily be imperfect, and if that error in the process of nutrition be corrected, it must be done by double duty being devolved on the respiration, while perfectly assimilating chyle prepared by such intestines and stomach.

It is demonstrated that the error in nutrition alluded to, is corrected in the case of drunkards. The necessary conclusion then must be, that of all the steps in the process of converting food into healthy blood, perfect respiration is the most important, for it can so change the chyle that, though it may have been imperfectly formed, no tuberculous deposition will occur.

If so much can be accomplished in the case of drunkards towards the purification of the blood, a fair and legitimate deduction is, that the same results can be accomplished in a shorter time, and more perfectly, by due attention to physiological laws, without the habitual use of alcohol which tends to prevent the formation of healthy chyle.

To show that the same results can readily be accomplished without the use of alcohol, I will mention the case of a gentleman now actively engaged in business in this city. About seven years since he was told by his physician there was no hope for him, that die he must with consumption. He swore he would not die; did not intend to die for many a day; quit all medicine; took to sponging himself every morning, forcibly inflated his lungs to their fullest extent as soon as he arose; did so frequently during the day; threw his shoulders back so as to give his lungs fair play; always walked with his arms thrown over a cane across his shoulders, so as to avoid attracting too much attention; took as much exercise by walking as his strength allowed, gradually increasing it as his strength increased; got rid of his cough and hectic fever; regained his health, and is now fat and hearty, measuring six inches more in the circumference of the chest than he did when told he was bound to die; and never thinks of the "last stage of consumption."

Another fact not requiring much comment is, that singing is recommended by the best authorities for all persons with weak lungs; as they must breathe more freely while singing, of course assimilation is more perfect. Singing has a doubly beneficial effect; first, it renders assimilation more perfect; secondly, it enlarges the chest, and thereby renders a permanent benefit, by giving the person a more capacious organ for the performance of the various functions.

It is a well-established fact, that pregnancy generally suspends the progress of a consumptive case temporarily, and yet in not a single work on the practice of medicine, nor even in the large number of works devoted exclusively to the diseases of females, can a rational explanation of that fact be found. Now

if we place in a juxtaposition the above propositions, and the fact that, in consequence of the heavier demand on her for oxygen, and on account of the extra weight she carries, the pregnant female is "short winded," and to relieve those uneasy sensations makes fuller inspirations than ordinarily, and also about four to three that are made in the non-pregnant state, the matter is settled at once. We see at a glance, that her more perfect respiration purifies the blood so much, that the deposition of tubercles is temporarily arrested and life prolonged. The fact proves the propositions, and the propositions explain the fact.

After her confinement the deposition of tubercles goes on at a rapid rate from a combination of causes; the nervous system is much exhausted; the digestion is considerably impaired from her condition, from the usual dosing with hot teas and medicines, and also from lactation; hence, a considerable quantity of the chyle thrown into the system is imperfectly formed, and the process of assimilation is rendered imperfect in the lungs from her lapsing again into her former habits of respiration, and from her inactive life. All these causes operating at once, the necessary consequence is, that tubercles are deposited at a great rate, and the patint soon sinks. Here, again we find facts proving the propositions, and the propositions explaining the the facts.

Those propositions also explain why it is, that such a vast number of cases have occurred, apparently proving the contagiousness of consumption. The wife, while nursing the sick husband, breathed the same heated, vitiated atmosphere he did, and worn out with anxiety, fatigue, and want of rest, her digestion was very imperfect; consequently, the chlye furnished was not healthy, and the finishing process in the lungs was also very defective, because she was necessarily compelled to lead a partially sedentary life, and, in addition, the dry, heated, vitiated air of the chamber furnished a scanty supply of oxygen. Hence, all these cases having been combined, the deposition of tubercles in the lungs of the wife was almost unavoidable, and her taking the disease appeared to be a plain case of contagion.

Hippocrates, sent his consumptive patients on a pilgrimage,

on foot, to the city of Megara; Sydenham, sent his patients, on foot, to search out a wonderful Dr. Robertson, residing in York. The sharpest eyed mortal that ever lived, would never be able to find any trace of the contagious spreading of the disease from patients thus treated.

Tight-lacing females are also far more liable to tuberculous depositions, than those who do not thus commit suicide. Careless observers might perhaps suppose, that in the case of such females, deposition ought to occur where the constriction is, namely, at the base of the lungs; but, if any one will put a girdle around his body, and watch the process of inflation of the lungs, both with, and without, he will find that the apex of the lungs cannot be inflated without first fully inflating the lower part; and that just in proportion as the lower part of the chest is restricted, so is a larger portion of the apex of the lungs rendered comparatively uselss, thereby enlarging the field for tuberculous deposition and hastening the process.

The extraordinary fullness always perceived in the spaces between the upper ribs, and above and below the collar bone, in tight-lacing females, has caused many a superficial observer to conclude, respiration was still well performed in the upper portion of the lungs when thus constricted; a very erroneous conclusion indeed.

When the lower part of the chest is constricted, the lungs are forced into a smaller space, and that part least used in ordinary healthy respiration will be less used still, (in consequence of the pressure of the adjacent portion obstructing the admission of air,) as air will go where there is least resistance. As before, specified, it is absolutely impossible to fill completely the upper part of the lungs, until the lower is first fully expanded. Now, in a tight-lacing female, the upper part being impeded by the pressure, the lower part, upon which extra duty is devolved by the lessening of the capacity of the chest, must necessarily expand in a greater degree than ordinary, and by that expansion, the inress of air into a larger portion of the apex of the lungs than in ordinary healthy respiration, is cut off. The unused part being

interposed as a cushion between the widely expanded inferior portion, and the intercostal spaces, an extraordinary cushion-lik protrusion is perceived in those spaces, and even above the collar bone.

That this is the true view, can be made evident in a moment by the examination of the expansion of a healthy, unimpeded chest; there will be no protrusion *above* the collar bone, but, on the contrary, there will be a slight depression perceived.

We likewise perceive in the latter stages of consumption, an extraordinary protrusion of the spaces between the upper ribs and above the collar bone, the upper part of the lungs being filled with tuberculous depositions and the products of the inflammation excited around them; and also, being still further impeded by the formation of large cavities, as a matter of course, such a large portion of the lungs being rendered useless, double or triple duty is imposed on the inferior part, and the sufferer being compelled to inflate it to its utmost extent, thereby causes the unusual protrusion above and below the collar bone, and in the spaces between the ribs. The same superficial observation, that would induce one to conclude respiration was well performed in the upper part of the lungs of a tight-lacing female, would likewise cause him to conclude, from the same protrusion of the intercostal spaces in a dying consumptive, that respiration was still well performed in the apex of the lungs, when, in fact, a post-mortem examination would show there was scarcely space enough for a thimble full of air in that part. And if a post-mortem examination of a consumptive patient could be witnessed by every tight-lacing person, whether female or male, it would tend more to prevent that murderous constriction of the chest, than all the essays that ever have been or ever will be written. No one expects to see an Indian belle, who has grown up with her loose flowing robes around her, wasted and wan in the last stage of consumption, and finally carried to her grave at "sweet seventeen;" nor does any novelist represent a Die Vernon sitting in a garret

"Stitching to the song of a shirt."

The station and character would be incompatible according to the observation of all. Shall we be content to say, "Nature has so arranged it," or shall we exercise the reasoning faculties the Creator has given us in investigating why she has so arranged it, and turn the result of our observations to practical use, to save the lives of suffering thousands, and prevent tens of thousands from becoming subject to those diseases. If, then, universal observation shows us that precisely in proportion to the free use of the lungs, is the exemption from tuberculous disease, and, vice versa, in proportion to the imperfect use of the lungs is the liability to tubercles, it is a plain case that the free use of the lungs purifies the blood by eliminating morbific matter, or prevents it from entering; there is no middle ground. The lungs must either throw out the impurities, or prevent them from entering. As before mentioned, if the impurities were thrown out, they would be there to speak for themselves, and be as readily found as the carbonic acid; but, as they are not found, no other conclusion is left us, than to say that the chyle is so perfectly assimilated, the blood remains pure, and, of course, no tubercles can be deposited; or, in cases of recovery after disease has actually supervened, the blood is purified by the free respiration removing the unassimilated chyle, thereby removing the cause of the disease.

As all truths harmonize, the facts in relation to the quality of the air respired ought to be in harmony with the above. Accordingly, we find all medical authorities on the subject, affirm that those who live in cellars, or are crowded together in badly ventilated rooms, are much more subject to tuberculous diseases than those who live in high stations, breathing the pure air. This is so familiar, further words are superfluous. If the reader will bear in mind what has been said, a birds-eye view of the proof, both positive and negative, can easily be taken, and they will all be found to centre on perfect respiration.

POSITIVE.		NEGATIVE.
Drunkards.	Perfect Respiration. and Perfect Assimilation.	Sober men.
Base of lungs.		Apex of the lungs.
Active lives.		Sedentary lives.
Capacious chest.		Narrow contracted chests.
Dairy cows roaming.		London dairy cows.
Monkeys at liberty.		Monkeys caged.
High situation.		Cellars.
Well ventilated rooms.		Crowded, badly ventilated rooms
Out-door life.		In-door life.
Indian belle.		Tight-lacing belle.
Chyle first passed through the lungs.		Chyle not thrown directly into the arterial system.

Let us now turn to the practical, and see what success attends it. But before doing so, it may be best to premise that a large majority of the best medical authorities, concur in considering the tuberculous and scrofulous conditions of the system as nearly, if not absolutely identical; the symptoms of the deposition of tubercles merely varying according to the part of the system involved; thus in the lungs, tubercles produce phthisis; in the lymphatic glands, scrofula; in the bones, white swelling, &c.: it will therefore be unnecessary to dwell at length on scrofula in this treatise, for the impurity of the blood resulting from the same cause, namely imperfect assimilation, can certainly be removed by the same means. From the foregoing remarks, we are fully prepared to appreciate and properly interpret, the following remarkably interesting case from Nelson's American Lancet, June, 1854, p. 127. It is a letter from Dr. James Norcom to Dr. Physic; the dates should be carefully noticed to see how long the patient remained cured.

EDENTON, N. C., Feb., 1830.

DR. PHYSIC, Philadelphia—Dear Sir.

* * * * * * * * * * *

In the month of April, 1812, after having been extremely reduced by an attack of bilious fever, I was seized with a cough, which continued, with great obstinacy and severity, until the month of November, when decided symptoms of phthisis began to make their appearance. I had every evening an exacerbation of fever preceded by chilliness, and succeeded by copious perspiration: my cough began to be less painful, but was attended with an expectoration of mucus mixed with pus. Before this

complaint came on me, I had accepted a surgeon's commission in the Army, and was stationed at Tarborough, about seventy-five miles from this place. In the month of December, the part of the regiment which had been recruited, then having been ordered to Salisbury, it became my duty to repair to that place.

Accordingly, about the middle of the month, in the situation I have described, I set out on my journey.

In two days I reached Raleigh, without having experienced any material change in the symptoms of my complaint. During my stay in Raleigh, the disease increased every day, so that I was obliged to remain there nearly a week; at the expiration of which time, I had almost determined to retrace my steps, return home, and take my station among the forlorn, and despairing victims of this unrelenting malady.

But reflecting deeply on my situation, and recollecting that scarce a patient in a thousand, had been known to recover from the disease after having been confined to bed by it, I was resolved to resume my journey, and to reach the place of destination, or perish on the road. It will be impossible for me ever to forget the effort I had to make in pursuing this resolution. On a cold and blustering morning about the 20th of December, weak and emaciated, having been literally drenched in perspiration the night before, I ascended my gig and proceeded on my journey. The first part of my ride this day, was excessively irksome, and fatiguing. Every hovel and hamlet on the road seemed to invite me to rest, and to dissuade me from the prosecution of my undertaking. Often and anxiously did I wish that my disease had been of such a nature, as to allow me to indulge the inclination I felt, to desist from motion. But I continued my ride for three hours, when I found it necessary to stop for a little refreshment. While dinner was preparing, I lay down on a bed to rest. It was perhaps an imprudent act: never was a bed so sweet to the wayworn and exhausted traveler, as was this to me. I lay on it for an hour, wrapt as it were in Elysium; when summoned to dinner, though sleep was fast stealing on me and inviting me to be still, I arose and attended,

and after having made a moderate meal of very common country food, I resumed my ride, and at night, about half past six o'clock, arrived at Hillsborough, which is distant about 26 miles from Raleigh. The Inn to which I had been recommended was unusually crowded, and I had to accept of a room that was out of repair; the window sashes rattling in their casements, and the wind passing through the sashes in several places. In such a chamber, at such a season, and in the situation already described, was I quartered for the night. To my surprise, however, I had a better night's rest than I had had for several weeks, had less perspiration, and coughed less, than I had done for a month before.

In the morning, considerably refreshed, I proceeded on my journey, and traveled in a foggy, misty atmosphere full forty miles: the next day about thirty-five, and on the 4th day about 12 o'clock, I arrived at Salisbury. On my arrival, I heard it mentioned as a matter of astonishment, that a man in my situation should think of traveling in the cold and inclement season of winter, much more astonishing, that I should venture to approach the mountains at such a period. But I had taken my resolution, and was determined never to relinquish it, while I had power to walk or ride. The regiment to which I was attached, was encamped about four miles from the town of Salisbury. To this place, I tasked myself to ride twice every day, a duty I regularly performed in the coldest weather until I left the service.

Early in January, the officer in command received orders to repair with his regiment to Canada. While preparations were making for this purpose, believing that such a climate would be too severe for me, and that I must of course soon cease to be useful to the government, I addressed a letter to the Secretary of War, soliciting permission to retire from the Army. This request was promptly and kindly granted to me. In Feb., 1813, I commenced the practice of my profession again in this place, and continued to attend to the most laborious duties of it, at all times of the day and night, in rain, hail, snow, storms, and sunshine, whenever I was called on, for eighteen months.

At the end of that time, I had lost my hectic fever, night sweats, purulent expectoration, and my cough had nearly left me, my chest had recovered its capacity of free and easy expansion, and the ulcers in my lungs had entirely healed. Many who read the foregoing statement, will no doubt be curious to know what medical means were used as auxiliaries in the cure of this very alarming state of disease. It would not be in my power to satisfy curiosity on this point, were it a matter of any importance, which I conceive is not the case: *the complaint having been cured by hardy, invigorating exercise, continued without interruption in every variety of temperature, and weather,*

That palliatives of different kinds were resorted to at various periods, must at once be supposed, but I do not consider it a matter of consequence to name them; as they were generally such as would readily suggest themselves to physicians of every grade of skill or intellect, and never produced more than a temporary alleviation of symptoms. Perhaps it may be material to state, I never used opium in any form whatever, and that I never incautiously wasted the recources of my constitution by depletory, or debilitating means. When symptoms of high arterial excitement occurred, which would sometimes be the case, it was my practice to abstain from strong, high seasoned food, from all fermented and spirituous liquors, and from active exercise until they subsided. By this negative mode of management, I generally succeeded in removing inflammation without materially impairing the energies of my system; and on the increase of the purulent discharge, subsequent to such inflammatory appearances, I betook myself again to my exercise, and ate and drank every thing I wanted. I always found that the inconvenience produced by a full meal, yielded very soon to horse exercise, and that I generally coughed less while riding than at any other time. The hectic paroxysm was generally interrupted, and sometimes cut short, by a hard ride, and often, very often, during the existence of my disease, have I checked an exhausting flood of perspiration, and renewed my strength and spirits

by turning out of bed at midnight, and riding a dozen miles or more; many a time, too, have I left my bed in the early part of the night, wayworn with coughing, restlessness, and sweating, for the purpose of visiting a patient, and after having rode for an hour or two, returned home and slept quietly and refreshingly for the remainder of the night.

Another thing which I remarked in the course of my experience in the disease was, that some of the most profitable rides I ever took were made in the coldest and most inclement weather, (air dense and plenty of oxygen for assimilating, *W.*) and that scarcely in any situation did I return from a long and toilsome ride without receiving a sensible amendment in all my pulmonary complaints. In short, Sir, were I asked to state in a few words the remedy which rescued me, I should say it was a life of hardy exercise and of unremitting toil, activity, and exposure. With pectoral medicines, or those articles or compositions denominated expectorants, I seldom meddled in my own case; without opium, which, from a constitutional peculiarity, I have not been able to take for many years, I found them too debilitating, and with it, had I been able to use the article, I should not have been disposed to take them, lest their effect in disposing to rest, and inactivity might have operated against the course I had prescribed for myself, and from which I expected relief.

It remains for me to mention another agent which I think excited a very decided curative influence upon my disease, and that is singing. In first using this remedy it was my custom to sing in a low tone, and not long at a time: so as not to occasion much pulmonary effort. But by degrees I became able to sing in the most elevated tones, and for hours together, allowing myself only such intervals of rest as the lungs required to obviate injurious fatigue. So long, and so frequntly did I repeat this act, in the course of my disease, that the exercise of riding and that of singing became so strongly associated, that as soon as I mounted my horse or ascended my chaise, I found myself humming a tune, and of often in my lonely rides through the country,

at late and unseasonable hours of the night, have I made the woods vocal with the most exhilarating music. Singing seemed always to have the effect of cleansing the bronchial passages, of opening the chest, and of giving a greater capacity of motion and expansion to the lungs. * * * * *

Yours, &c.

JAS. NORCOM.

Dr. Norcom also mentions a case cured in 1810 or '11, which was entirely exempt from pulmonary disease in 1830, and the prescription was tinct. digitalis, and a ride of ten miles every day. Under this treatment, the patient rapidly improved so as to be able to ride ten miles twice a day, and "in about two months from the time of his coming under my care he returned to his former residence, and *by a continuance of exercise was restored to perfect health.*" The Doctor also mentions a third case cured by mercury and exercise, and as the profession is now perfectly convinced mercury and digitalis avail nothing towards curing the disease, the unavoidable conclusion is, that the exercise deserves the credit, ergo, my propositions are sustained by a successful practice.

The following case reported by Dr. Stokes is a remarkable one, and fully confirms my propositions: that the patient was actually afflicted with phthisis. and was actually cured, no one will dispute, for the Doctor's skill is too well known. *American Journal of the Medical Sciences, April*, 1855: *p.* 503.

"Some years ago, I saw a gentleman who came to town laboring under all the symptoms of well marked phthisis. The disease had been of several months standing, and the patient *was a perfect picture* of consumption. He had a rapid pulse, hectic, sweating, purulent expectoration, and all the usual *physical signs* of tubercular deposit, and of a cavity under the right clavicle. I may also state, that the history of the disease was in accordance, in all particulars, with this opinion. I saw this patient in consultation with a gentleman of the highest station in the profession, and we both agreed there was nothing to be done. This opinion was communicated to the patient's friends,

and he was advised to return to the country. In about eighteen months afterwards, a tall and healthy looking man, weighing at least twelve stone, entered my study with a very comical expression of countenance: "You don't know me, Doctor," he said. I apologized, pleading an inaptitude that belongs to me for recollecting faces. "I am," he said, "the person whom you and Dr. ——— sent home to die last year. I am quite well, and I thought I would come and show myself to you." I examined him with great interest, and found every sign of disease had disappeared, except that there was a slight flattening under the clavicle.

"Tell me," said I, "what you have been doing." "Oh," he replied, "I found out from the mistress what your opinion was, and I thought as I was to die I might as well enjoy myself while I lasted, and so I just went back to my old ways." "What was your old system of living?" said I "Nothing particular," he said, "I just took what was going." "Did you take wine?" "Not a drop," he replied, "but I had my glass of punch as usual." "Did you ever take more than one tumbler?" "Indeed I often did." "How many; three or four?" "Aye, and more than that, I seldom went to bed under seven!" "What was your exercise?" "Shooting," he said, "every day that I could go out." "And what kind of shooting?" "Oh, I would not give a farthing for any shooting but the one." "What is that?" "Duck shooting." "But you must have often wetted your feet." "I was not very particular about the feet," says he, "for I had to stand up to my hips in the Shannon for four or five hours of a winter's day following the birds." So, gentlemen, this patient spent his day standing in the river, and went to bed after drinking seven tumblers of punch every night; and if ever a man had recovered from phthisis he had done so when I saw him on that occasion. Suppose now, that he had been confined to an equable temperature and a regulated diet, and had been treated in all respects *secundum artem*, what would have been the result? Any of you can answer the question. In point of fact, this very treatment had been adopted

during the first three months of his illness, and his recovery may be fairly attributed. not so much to the duck shooting and whiskey punch, but to the tonic and undepressing treatment which he adopted for himself, and which his system so much required to enable him to throw off the disease."

The late Dr. Parrish relates various cases confirming in a striking manner, the views above presented, and perhaps it will be better for me to give the same remarkable contrast, which the Doctor presents in the result of two cases which fell under his observation at the same time; the reader will then perceive more clearly the great advantage of a practice based on correct principles.

Dr. Parrish first reports a case, [North American Journal of Medicine, vol. 8, p. 276,] treated *secundum artem*, and of course with a fatal result. "The patient whom I attended (in consultation with Dr Rush, and another highly distinguished physician) was a young man not more than twenty-four years of age, the eldest child of an anxious and affectionate father, whose wealth enabled him to command every possible assistance, and who having lost a wife with pulmonary consumption, was alarmed by the first appearance of symptoms in his son, so that no delay was incurred in commencing the treatment, and no means were spared which it was thought might be productive of advantage.

As it was in the beginning of winter, that we were called to the patient, our first object was to obviate the effects of the weather: we therefore had him placed in a spacious apartment, the air of which was maintained at a uniform temperature by night and day throughout the season.

This was effected by means of a soap-stone stove and a thermometer suspended in the room.

The treatment at first, consisted in a system of rigid dieting with small and frequent bleedings, and the use of mercury. Ptyalism, however. could not be induced, and as the patient grew worse under the present plan, we laid aside the mercury, and resorted to diaphoretics: sulphur and tar water were also

prescribed, under the impression they had been useful in similar cases. But our remedies appeared to make no impression on the disease, which marched steadily forward. Various medicines were afterwards used with little advantage: among the rest, acetate of lead which was given in the dose of two grains every two hours, for several days in succession, with the effect of diminishing the frequency of the pulse, but as it induced symptoms of colic, we were under the necessity of abandoning it. At this period I visited the patient twice every day, and my colleagues every morning, and nothing was omitted which occurred to the long experience or sagacity of those highly distinguished physicians, as likely to be productive of benefit. At length, that stage of the disease arrived, in which a supporting treatment was thought to be required. A stimulating diet, with tonics of various kinds was now resorted to; but all our efforts proved unavailing. The patient came under our care in the early part of winter, and died before the close of the following spring.

In the immediate neighborhood of this young gentleman resided a student of medicine, afterwards a respectable practitioner. In the preceding summer, while a resident pupil in the Philadelphia Hospital, he had been attacked with hæmoptysis, in the treatment of which, a vigorous course of depletion had been pursued. The hæmoptysis disappeared, but was soon followed by considerable debility. A visit to the country did not restore his health, and he returned in the fall, too unwell to resume his duties in the Hospital.

At the commencement of winter, any one upon observing the two patients, would have supposed that the student was further advanced in the disease, more reduced and more likely to pass away, than his unfortunate neighbor. He was pallid, emaciated, had cough and fever, in fact, exhibited all the marks of confirmed consumption. He resisted however, all attempts to induce him to submit to medical advice, from a belief that the practice which would be adopted, would tend only to hasten a fatal issue. The winter passed with no other treatment than

the occasional use of slight palliatives, as paregoric to allay cough, and the spring, which saw our patient carried to the grave, opened upon this young gentleman still alive. As soon as the weather permitted, he went into the country, and furnishing himself with a horse, sick and debilitated as he was, commenced the life of a country doctor. Strange as it may appear, he rode himself into perfect health. He acquired an extensive practice, married, and became the father of several children. He afterwards returned to the city and fell a victim to typhus fever contracted during his attendance on the business of the dispensary. This happened ten or twelve years after the winter above alluded to, and not a spmpton of his former complaint was observable for a long time before the period of his death.

I often conversed with this gentleman relative to his case, and remember being told by him, he found no remedy so effectual in relieving his distressing chilliness, as a ride on horseback.

In the midst of a chill, while sitting by a large fire, having the back of his chair covered by a large thick coat, or blanket, and yet unable to keep himself, warm, he would receive a message from a patient at a distance, requiring him to mount his horse. Almost immediate relief would be experienced from the exercise, and a ride of a few miles would produce so much excitement as to restore him to comfortable warmth.

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"Most of the medical men of this place are familiar with the name of Dr. Baldwin. This gentleman had a strong hereditary predisposition to pulmonary consumption. He had lost a father and several brothers with the disease, and was himself attacked with it soon after he graduated, and while a resident of Wilmington, Delaware. Aware of the nature of his symptoms and convinced that fatal consequences must result, unless he should depart in his own case, from the ordinary routine of practice, he determined to try the effects of a change of climate united with unusual bodily exertion. In the midst of winter he embarked for Savannah, Ga., bearing with him letters of introduction to persons of the highest respectability in that place. This hap-

pened at least five or six years before his death. On his arrival at Savannah, he made up his mind to travel on foot to Millidgeville, the capital of the state, which was distant about one hundred miles. His health was at this time, so much impaired, that his friends at Savannah were disposed to consider him little short of a maniac. Disregarding however their representations, he took from his trunk some necessary articles of clothing, tied them in a handkerchief, ran a stick through the bundle, and placing it on his shoulder, set off on his pedestrian journey. As the country was but thinly settled, he endured many hardships and privations, being sometimes compelled to wade through streams, and often taking up his lodgings in cabins, among people as untutored as Indians, and partaking of their homely fare of ham and corn-bread. Arriving safely at the capital, he there met with Col. Hawkins, agent for the United States, among the Southern Indians, by whom he was treated with great attention, and invited to accompany him to his residence. He accepted the invitation, and having passed the winter at the agency, found himself upon the opening of summer, nearly restored to health. On his return from this place to the coast, having learned that the Naval surgeon at the station of Saint Mary's had died, he agreed at the request of some persons concerned, to fill the vacant place until they could hear from Washington. Soon afterwards, a commission appointing him a naval surgeon was received, which he was induced to accept, and having settled in the country, he remained there for several years free from disease. On the fitting out of the expedition to the Yellowstone River, he accepted the appointment of botanist, and having been attacked as I have been informed by his old complaint, died upon the journey. There can be no doubt his disease was suspended several years by the course of life he pursued.

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From a fine healthy looking practitioner of New England, I received the following account:—In early life he had been affected with pulmonary consumption, and while still laboring

under the disease had commenced the life of a country doctor. As there happened to be an uncommon degree of sickness in the neighborhood at that period, he was compelled to make great and unusual exertions, and the result was a perfect restoration to health. In the course of conversation, he said to me (I copy his words), "I have left a patient at home laboring under pulmonary consumption, with directions to ride ten miles every day, be the weather what it may." This was in the winter season.

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"The following notice, handed me by Dr. Gillman, was drawn up by a gentleman of Ohio, the father of the Doctor, and dated Marietta 1823.

In the year 1804 Thaddeus E. Harris, a clergyman of Massachusetts, called at my house in Marietta, and from him I received the following account.

He had left Dorchester, Mass., that spring, so low in consumption that neither he, nor any of his friends, had an idea that he would be able to reach Hartford, Conn., distant about one hundred miles. He arrived there, however, and though still very weak, he was encouraged to prosecute his journey to New York. When there, finding that he was gaining strength, he concluded to proceed to the western country. On his arrival at Marietta, he was so well as to be able to ride forty miles per day, to preach, and was in fact, quite recovered. He returned to his parish in Dorchester in good health, and the last time I heard from him, which was about two years since, (1821) he was still well."

A gentleman of this city, when a young man, came under my care during the winter season, affected with cough and hectic fever. I felt great solicitude in his case, and determined to try the effects of horseback exercise. In compliance with my advice, he rode daily through the winter, and in the spring was evidently improved. The summer opened upon him still affected with alarming symptoms. It was during the late war; and in the course of the season, Camp Dupont was formed. The

young man joined one of the volunteer companies, marched down with the rest, and was subjected to all the hardships of a camp life.

His health and strength increased, and he is now a hearty man, free from all signs of pulmonary disorder.

Another very interesting case occurred to me, with a similar result. A little son of a respectable citizen of Philadelphia was affected with cough, hectic fever, profuse sweats, and great emaciation, and there was every reason to believe that his lungs were affected with tuberculous disease. Entertaining the conviction that any active medical treatment would insure a fatal termination to the case, I strenuously opposed the use of remedies which were pressed upon the parents by the kindness of their friends. Among the rest, mercury was proposed. Happily they were disposed to listen to the suggestions of their physician, and no active treatment was employed during the winter. At the opening of spring, the child was sent into the country, with directions that he should have the benefit of free exercise and the open air.

He returned free from the pulmonary complaint, has since passed through the whooping cough, and remains well to this time.

Shortly before the death of Dr. Wistar, an interesting young lady was brought from New Jersey, to consult him for chills, fever, pain in the breast, cough, and considerable loss of voice.

These symptoms presented gloomy aspects. The Doctor being absent on a journey when the lady arrived, she came under my care, and I had seen her several times before his return. We afterwards visited her together, and made a very minute examination of her case. Dr. Wistar having been travelling over the mountains, in which mode of life he took great delight, was fully prepared to appreciate the effects of air and exercise. We had retired for the purpose of consultation, and had re-entered the apartment, when looking around the room, he made this remark to me: "Doctor, do you not think it looks rather close and confined here? Do you not think it would be best to

send her back to the country, and direct her to ride every day?" I heartily concurred in the proposition.

We put a seton in her side, and then advised her to return home, and use exercise. The winter passed over. The following summer, she visited Philadelphia greatly improved in health, and, as I afterwards learned, became perfectly well. Vol. 9, p. 147. "Some years ago, I was called to a very delicate female who had been attacked very suddenly with hæmoptisis, and within a very short time had discharged as much as a pint of blood from her lungs. By bleeding, rest, appropriate regimen, and other means usually employed in such cases, I succeeded in the course of a few days in arresting the hæmorrhage, but hectic fever now made its appearance, attended with cough, and other symptoms strongly indicative of phthisis, which in her case was the more to be apprehended, as she had lost her mother with that disease. The winter was approaching, and if any advantage was to be obtained from exercise, the time for commencing it could not be delayed.

I laid my views of the case fairly before the family, and suggested that the choice rested with her to carry these views into immediate effect, or if they should appear too hazardous, to have the assistance of further medical advice in consultation. They were content to rely upon my judgment. The patient was recommended, notwithstanding the recent hæmorrhage from her lungs, and the lateness of the season, to take exercise freely in the open air. She followed my advice, riding out in a carriage and walking frequently, not allowing even the coldest weather to confine her to the house. The consequence was, that her consumptive symptoms gradually disappeared, her strength increased, and she was ultimately restored to health: nor has she subsequently had any return of her complaint.

A similar case is mentioned in Morton on Pulmonary Consumption. P. 144.

"After the capture of the remains of the gallant detachment, under the command of Col. Baillie by Hyder Ally, the utmost exertions were made to convey the prisoners, among whom was

my informant, beyond the reach of rescue. A sergeant, one of the unfortunate men, then labored under the worst symptoms of phthisis, and at this time suffered greatly from colliquative diarrhea.

The merciless enemy, regardless of his wretched situation, forced him at the point of the bayonet, to keep up in the hurried march, for no kind of carriage was allowed. After the first two or three days, the sergeant became more able to march, and before his arrival at the place of destination, all the symptoms of his disease vanished. A scanty allowance of rice was his only food."

Dr. Jackson mentions in his Letters to a Young Physician, p. 175, a singular case. A man presented himself in the month of May, who lived in a retired part of Maine below the Penobscot river. He had come from his home with great inconvenience, to seek for medical aid. I found that he had the usual symptoms of phthisis; he had been confined to his house in January, at which time he had sweat profusely in the night, was much reduced in strength, and wretchedly sick. He saw, however, that he and his family must starve if he could not engage in his usual winter employment of cutting wood.

After much reflection, he went forth on the first of February, with his axe on his shoulder. He labored for half on hour, when he was so exhausted the he was forced *to lie down upon the snow*. Thus ended his first day's trial.

He persevered however, and by degrees gathered strength, so that at the end of the season he could do a moderate days work.

Sometimes simply abstaining from the usual *secumdum artem* treatment, and taking a sea voyage will be sufficient to effect a cure, as shown by the following case condensed from the American Journal of Medicine, vol. 2, 1828.

"J. S., a student of medicine, in the winter of 1786–7, was troubled with a severe cough and pain in the breast, but nevertheless improved sufficiently to commence the practice of medicine with flattering prospects of success; but they were soon

blasted by the cough returning with increased severity in the fall 1787, which soon disqualified him for active exertions, and compelled him to take up his abode at his native place, Moffat, a fine inland village in the south of Scotland, much resorted to by strangers on account of its medicinal springs. Here he tried, as fully as possible, all the known remedies as directed by the first Scotch physicians, and so numerous were the blisters and plasters he found necessary to apply, that his breast at this day is as smooth as the palm of the hand.

"These remedies, though faithfully attended to, seemed only to palliate the symptoms, not to check the disease in its career, for almost every night, or towards morning, he had considerable sweats, attended with a harassing cough and gross expectoration, and he daily became more and more emaciated. He finally determined on a sea voyage, and on the 25th August, 1788, he landed in Virginia, after a voyage of eight weeks and some days —relieved from his hectic fever, pain in the breast, and purulent expectoration; nor was his cough troublesome.

"Since that time till now (1828,) he has enjoyed, upon the whole, good health, never having suffered much by any complaint except those of a bilious nature. For some years past, he has been extensively engaged in the duties of his profession, subjected to the various extremes of heat and cold, during day and night, without any return of his cough or any affection of the lungs which gave him uneasiness."

The following cases reported by Prof. Thomas. Henderson, of Columbian College, D. C., (American Journal of Medicine, vol. 8,) also show most clearly, that my propositions are sustained by successful practice.

Case 2. Miss ——, sister of the lady whose case has just been given, was for many years threatened with consumption. She had a very flat chest, cough, expectoration, great debility, pain in the side and breast, amenorrhea, flour albuns. She became much emaciated, and all who knew her, were assured that the hereditary family disease would soon terminate her existence.

Nothing that affectionate solicitude could secure, was withheld. I attended her for a long time, endeavoring, while I guarded against inflammatory action in the lungs, to prevent increase of debility. *Particular attention was given to avoid active exercise* or exposure to cold. Her health did not improve. Being sincerely pious, and desirous to practice what she professed, she insisted on attending evening prayer-meeting; and on uniting with other institutions for benevolent purposes. These involved a change in her habits, against which I remonstrated, and in which she was opposed by her friends. She, however, gradually adopted her own course, took no medicine, went out at night, and exerted herself far beyond what was thought discreet. She improved in health, her mind became more cheerful; it was obvious that the change of habits had no unfavorable influence. The pulmonary symptoms declined. She married soon after, has children, and now enjoys good health with every prospect of long life.

Case 3. Mr. —— is the brother of the lady referred to in the aforesaid case; has a striking resemblance to his mother who died of phthisis. At eighteen he had cough and pulmonary symptoms, but he entirely disregarded the monitions of hereditary predisposition, the actual symptoms of breast complaint, as well as what might be anticipated from a very narrow, tall, and slender frame. He was engaged in laborious duties in a dry-goods store, afterwards pursued a life of much more active exercise and exposure to to all weather. He went two voyages to sea, and since follows mercantile business that requires bodily and mental activity. He preserved a good state of health for more than ten years. Of late, he has had an attack of hæmoptysis, but except for the the time, has not confined himself, and is recovering well from it.

Case 4. Miss ——, aged twenty, came under my care with many symptoms of tuberculous consumption, which disease had proved fatal to her mother's family. My patient had a hard cough, slight pain in the chest, expectoration of tough, ash-colored mucus, great debility, pain in the loins, and there was

an irritable frequent pulse. I was exceedingly apprehensive of the result and treated her case circumspectly in the way usually pursued by the best practitioners.

She took digitalis, cicuta; was bled, was blistered, and all this, without benefit. Seeing that no relief was afforded by medicine, and that prescribed cautions as to exposure and exertions, denied her many of those enjoyments that a fine mind and a cheerful spirit derived from social intercourse, in visiting her friends, she gradually ceased consulting me, adopted her usual habits, and lost no health by giving up medicine. She traveled; married some time after; is the mother of several children; has pursued an active life, and has no reason to apprehend a return of her symptoms.

Case 5. Dr. B——, while a student of medicine, attracted my attention. His family has been severely afflicted with tuberculous phthisis. Within a year, two brothers and one sister died of it. He had pulmonary symptoms, pain in the breast, cough, once spit blood, and his friends deeply feared that he would fall a victim to consumption. His brothers and sister were attended carefully by an eminent physician, who pursued the routine thought best for the case: he adapted that routine with great intelligence to the several cases. I was consulted in two of the cases; no benefit resulted from medical treatment.

Dr. B—— was so situated as to be compelled to walk two miles every day to attend the medical lectures, and to return the same distance every evening. This he did with unvarying regularity, throughout all kinds of weather, and frequently remained in the dissecting-room till late at night. Such was his ardor for the acquisition of medical knowledge, that though with the above symptoms and much debility, he exposed himself to weather cold and wet, and to fatigue that others shunned. Occasionally the pain in the chest and debility were alarming, but he took no notice of them, and continued habits which I urged him to avoid. He, thus predisposed, continued those habits for three winters, and now lives in finer health than he ever enjoyed. His relations who died, carefully avoided exposure and exertion.

Case 6. Some years since, I was called to see a gentleman about twenty-two years of age. His father died of tracheal and tuberculous phthisis, and my patient had for some time labored under cough, purulent expectoration, hoarseness, pain in the breast, and had fever, with partial night sweats.

I could not doubt from his symptoms, and the attendant emaciation, that his disease was confirmed strumous consumption, and that it would terminate fatally. I prescribed various remedies, anti-hectics, mild tonics, bleeding twice for the pain, mucilaginous mixtures for the cough, blisters, &c. As the autumn approached, I endeavored to impress on his mind my views of what should be his winter arrangements, and these views were founded on flannel, and the fireside; particularly, that he should avoid exposure to cold and wet weather. He promised obedience to my advice as to the use of medicines, and exposure during the cold season. I paid great attention to his case and symptoms, but the treatment did him no good.

As his duties required exposure, he finally became impatient, went out as I thought at great hazard, abandoned the use of medicine, and as he rapidly lost flesh, it seemed almost certain that he would not live long. I discontinued my visits, as he took nothing, and was imprudent. He would walk miles in the coldest weather without a surtout, and without flannel. He never avoided wet walking, or exposure to rain or snow. He took what was most agreeable to him, and now, after for years continuance of those habits, he is in much better health. The pulmonary symptoms are comparatively slight, and he apprehends no bad consequences from them.

Case 7. About two years since, at the close of winter, I was consulted by a gentleman who had pulmonary symptoms. He had cough, expectoration, pain in the breast, lost his flesh, his constitution was delicate, his form slender, and his chest narrow and drooping.

I blistered him, gave him cough mixtures, and confined him to his room until the weather became mild. As he did not recover, I advised him to go by sea to New York, to reside in

the country, to take exercise freely, and to avoid medicine unless it became obviously necessary. I had the pleasure to see my patient some time after, with his symptoms entirely removed.

Medicine had no agency in his recovery.

Case 8. Mr. ———, æt 14, lost his mother with tuberculous phthisis. It deserves remark here, that his mother was one of a family of nine, every member of which family died of phthisis.

This youth was growing up with every appearance of scrofulous aspect, strong symptoms of pulmonary disease came on, as cough, thoracic pain, and I am informed that he once had hæmoptysis. He was advised to adopt the life of a sailor, the laborious duties of a common sailor. He went before the mast, and after having been two years at sea, seems to have a restored constitution, and is free from the pulmonary symptoms that threatened his life.

The following case from Rose's work on consumption is conclusive, p. 44. About the year 1810 Mr. Watson was employed in the counting house of my father-in-law, Chandler Price, Esq., who became much alarmed for his safety, in consequence of his having a continual cough, free expectoration mixed with blood and frequent attacks of hæmoptysis; debility, and emaciation soon took place, and in less than six months Watson was called a walking skeleton. Dr. Physic was consulted in his case and finding that he was determined to try a journey on horseback, gave him the best directions he could follow under the circumstances: he was to make short stages, to be well protected from the weather, to eat sparingly, to keep the bowels open daily with a mild pill of rhubarb and aloes, and never to sleep in a strange bed unless the blankets and sheets had been well dried the day previous. With these directions our friend set off (from Philadelphia) for New Orleans on horseback, I believe in the latter part of the summer of 1811.

The first day he reached Old Chester, fifteen miles: on the second of his journey, he had some spitting of blood, but made out to get as far as Wilmington, when he remained two days in consequence of bad weather. The eighth day he arrived at

Washington, where he again spit up some blood after a violent spell of coughing. He persevered on his journey, making short stages and finally reached New Orleans after traveling twelve weeks, much improved in his appearance, strength and spirits.

He had no return of hæmoptysis after he left Washington and his cough gradually subsided, being entirely free from it in about six weeks after he left his home in Philadelphia.

Early in the summer of 1812 he returned home by sea in fine health, and much improved in flesh; he continued to increase in size gradually for some years, until his weight became the only cause of complaint, having no return of his old disease since leaving Washington in the last of September 1811. He died of hydrothorax in 1841 at the age of sixty years.

Perhaps the reader is by this time ready to suppose, since I attribute so much to respiration, that I think the lungs decidedly the most important organ in the body, but it is altogether a mistake, there is another organ more important still, for, without it, even the lungs cannot do their duty properly; and that is the skin. According to well known chemical laws, one thousand degrees of heat become latent upon the conversion of water into vapor, and under this law a large quantity of caloric is taken up by the conversion of the perspiration, (in ordinary cases insensible,) into vapor, and thereby a due equilibrium of animal heat is kept up; and when the heat of the body would be certain to rise above the healthy standard from active exertion, the conversion of the profuse perspiration into vapor, takes up such a large quantity of animal heat, that an equilibrium is still kept up, and the person is relieved of those excessively oppressive sensations arising from active exertions when the skin is inactive, so well known by the term "short-winded." The skin may therefore be truly considered the safety-valve of the lungs, and its healthy action is absolutely necessary to a healthy action of the lungs; when the safety-valve is loaded down too heavily, evil always results. It is a law of the animal economy that when morbific causes are at work, the weakest organ goes to the wall, and according to their conditions, whether hereditary

or acquired, will be the development of disease in the form of colds, diarrhœa, rheumatism, etc.

The healthy action of the skin being so intimately connected with the healthy action of the lungs, as a matter of course we should look first generally to the lungs for disease, whenever the skin is inactive, and accordingly coughs, colds, inflammations, and tubercles, show us we are right; if the lungs be strong enough to battle successfully against the invader, diarrhœa, dysentery, cholera morbus, tuberculous deposits, etc., show that the digestive apparatus is the next weakest part, as we might naturally expect, from the intimate connection with the lungs, through the influence of respiration on the assimilative process. Hence, we can see the vital importance of attending to the condition of the skin in these diseases, or more correctly, in all cases.

A mechanical suppression of the functions of the, kin by varnish, or otherwise coating it, results in death. Among the experiments of M. Fourcault,* "A horse was impermeably coated over, and it died with a profuse discharge from the nose, and its blood resembled that of horses suffering from glanders. In rabbits and dogs, diarrhea supervened, and also, inflammation of the intestinal mucous membrane. In the latter, the liver was also enlarged, and congested, and in a state of softening. The mischief in other parts was manifested by effusion into the serous sacs, as the pericardium, and pleura, and by paraplegia, marasmus, and miliary tubercles in the lungs, apparently of recent production.

Those whose skins are neither protected by adequate clothing, nor cleaned by ablution, nor excited by friction, or muscular exercise, we can hardly suppose them to be in a much better state than the animals subjected to the experiments prescribed by M. Fourcault. The incrustation of dried perspirable matter, mixed with dust and various impurities with which they are in contact, must render their skins nearly as impervious as the coat of varnish does that of animals.

* Bell & Stokes, p. 252, vol. 2.

In a majority of the sufferers from this cause, poverty and the concomitant inability to make adequate provision for cleanliness and cutaneous hygiene must be pleaded in excuse for their neglect. But in too many instances, we find that those in better circumstances become voluntary victims to the same train of exposure. They choose to let their skin be choked up with accumulated impurities for days, weeks, months, and even years, without indulging it with a single bath, or thorough ablution. and perhaps without a good dry rubbing. Need we marvel that the poor lungs suffer, that the digestive apparatus suffers, that all the functions suffer from a deteriorated, if not a measurably poisoned blood."

During the French Revolution, perhaps the day the Goddess of Reason was crowned, a child was covered entirely with gold leaf, to represent a golden Cupid, and the poisoning of the blood was so effectually accomplished, that death was the consequence in a few hours.

It has been a maxim with me for years, that cholera infantum, diarrhea, dysentery, cholera morbus, and dyspepsia, could not be cured unless the skin resumed its natural action, which is always checked in those diseases. My explanation of the fact was based upon the doctrine of sympathy of the skin, and mucous membranes; but since I have been led to investigate the influence of respiration on assimilation, I have no use for the term, but reserve it for the hard cases. The following analysis is given:—the skin, say from cold, not being in a healthy working order, respiration cannot be properly performed; respiration being imperfect, assimilation is imperfect—assimilation being imperfect, disorder of the digestive apparatus, in some form or other, is the result. Now, let us pull at the other end of the chain: indigestible food being taken into the stomach, unhealthy chyle is formed, consequently unhealthy blood is circulated, that being circulated, the skin cannot perform its functions in a proper manner, hence a dry inactive skin. Let us now take it by the middle: respiration being impeded by posture, tight lacing, etc., assimilation is imperfect—asssimila-

tion being imperfect, disorder of the digestive apparatus follows; hence, seamstresses, tailors, etc., are nearly always dyspeptic. Though the contents of the stomach or bowels may be removed by purgatives or injections, yet the skin does not always resume its natural action, and the physician who has his patient frequently sponged, or bathed, will always cure the case sooner, and more thoroughly, than one who neglects the skin; for instance, a physician gave a lady calomel and quinine for two months, to break her fever, but could not; the skin was left dry, harsh, and scaly, and there was not a drop of perspiration during the whole time. I had her thoroughly rubbed from head to foot with hot water the first thing, and she broke into a profuse perspiration in fifteen minutes, and a few doses were sufficient to effect a cure. On the eighth day, from the time I took charge of the case, I passed her house, and she was standing at her door splitting a cabbage for dinner; it was a plain case that nothing but the condition of her skin prevented her recovery. But to return, if these views of assimilation, consumption, and scrofula, are correct, we should naturally expect disorders of the digestive apparatus to accompany them, and in harmony with them, do we find nearly all writers dwelling upon such disorders as existing throughout the whole course of the disease.

As far as my recollection serves me, all the depletory or debilitating plans of treatment have been laid aside, and tonics, with a nourishing diet, have alone been found beneficial; or in other words, the plan is to assist the assimilative process. Had I time and space, I could run through a score of plans beginning with cod-liver oil, and analysis will show that all those said to be beneficial, have for their leading indication, no matter what may be the means relied upon, to carry it out, to assist the assimilative process; and no plan calculated to debilitate, has stood the test of time. This analysis each reader can make for himself, and though it is merely an affirmation thus presented, yet I shall set it down as strong collateral evidence of the correctness of my propositions.

Of course the quality of the food, the condition of the nervous system, and the digestion, would have a most important influence in the treatment of any case, but those subjects are too extensive for me to touch upon at present. Perhaps the necessity of additional explanations in future may be avoided, if I add that I do not disregard the influence of food, digestion, and the condition of the nervous system in the preparation of chyle, and suppose the lungs to do the whole work; some hasty critic may, perhaps, seize his pen and endeavor to show that my views are altogether incorrect, because the influence of food and digestion in the preparation of chyle appears to be overlooked. Presupposing the food and digestion the most favorable to be obtained, the additional requirements are, that there shall be a plentiful supply of pure, fresh air, and that the action of the lungs be unimpeded by any cause whatever.

If we would bear in mind that Dame Nature is a cook, and a fastidious one too, (for while our wives are cooking our dinners, she is cooking our breakfasts over again,) the importance of furnishing good materials and an ample kitchen would be seen at once. It is just as impossible for healthy life-giving blood to be formed from chyle prepared from unwholesome food, and finished off by lungs in a narrow contracted chest, supplied with a vitiated atmosphere, and restricted by posture, tight lacing, etc., as it is for our wives to furnish a fine dinner from musty flour, rusty bacon, and wet wood.

In order to cure our patients, then, instead of searching the forest for that grand vegetable remedy which Dr. Rush prophecied was growing in the Mississippi Valley, it would appear to me far more reasonable to look to the dinner table to see *what* they eat, and *how* they eat; to their chambers, to see *what kind of air* they breathed; and to their personal habits, to see *how* they breathed. By thus striking at those violations of physiological laws which produce consumption and scrofula, we may rationally expect to prevent them. Though these views may prove of immense advantage to the afflicted, yet, in my humble opinion, they will prove far more advantageous by the prevention

of disease; children of consumptive and scrofulous parents can generally be raised in such obedience to physiological laws as to prevent their liability to those diseases, and the hereditary transmission be thus cut short. I have no doubt if the community could be induced to live as they ought, in obedience to physiological laws, consumption and scrofula might be exterminated in the course of a century, as effectually as the small pox by vaccination.

P.S.—Perhaps it may save some inconvenience if I mention that the voluntary forcible inflation of the lungs, if continued too long at a time, will produce giddiness and sometimes nausea; there should be intervals of rest between the trials.

SUGAR-VAPOR CURE.

Dear Doctor:—The famous "Sugar-Vapor Cure" of Dr. Cartwright has frequently occupied my mind; and I send you the following analysis of it, to show how well the Doctor's practice corresponds to the propositions in my article on the prevention of consumption and scrofula. I am happy to enlist under such a distinguished chieftain; and to the small matters he overlooks in his grand march towards the elucidation of those diseases, I will carefully attend.

The propositions presented in my previous article are strongly sustained by the Doctor's paper; and when the two are put together, all the joints fit up square and true, nicely dovetailed. Thus unwittingly sustained by such a distinguished leader, I feel considerably encouraged, and hope others will be thereby induced to investigate the subject more thoroughly.

Dr. Cartwright, with his extraordinary scientific knowledge, is in love with the complex, and appears to be seeking out some grand scientific formula by which the whole rationale will be laid open to the world; and speaks of the "volatile aroma in the cane-juice, which perhaps imparts some *specific virtue* in the vapor that hangs like a cloud of incense over the boiling kettles of a sugar-house," or of the destructive effects of the

dextrogyrate sugar upon cold-blooded animals, or of its effects upon animalcules, to test, perhaps, Dr. Turpin's theory, that tubercles are of animalcular origin; while I, having only two mites of knowledge, am in love with the simple, and beg leave to call attention to some small matters he has overlooked.

Only two things arise from the boiling cane-juice — the "volatile aroma," supposed to contain that specific virtue, and the vapor or steam of the water holding the sugar in solution. The warm vapor, upon its inhalation, penetrates through, and is a local application to all parts of the inflamed lung, soothing and curing the inflammation excited around every tubercle; being, in fact, equivalent to the water-dressing recommended by all surgeons, thus entirely superseding tartar emetic, pustulation, setons, &c., while the volatile aroma, after serving to refresh the olfactories, not being of any further use, goes about its business.

This view of the subject is confirmed by the fact that hatters calculate on being cured of their colds and pain in the breast whenever they go over the kettles. Their lungs are healed nearly as efficiently by inhaling the steam from their kettles as they would be in a sugar-house.

But let us examine more thoroughly. I will state my propositions in a more succinct form.

1. Consumption and scrofula are caused by impurity of the blood.

2. That impurity of the blood is not utterly inexplicable and unmanageable, but is caused by neither more nor less than unassimilated chyle in the blood.

3. Assimilation is a physiological process, and cannot be assisted otherwise than by attention to physiological laws.

4. Good food and healthy digestion are two essential requisites for the furnishing of healthy chyle.

5. Perfect respiration is absolutely essential to perfect assimilation; and tuberculous depositions occur because respiration fails to put the finishing touch to assimilation.

6. According to the laws of heat, one thousand degrees of heat become latent upon the conversion of water into vapor.

7. In consequence of that law, a full, healthy action of the skin is necessary to keep up a proper equilibrium of temperature by evaporating the perspiration; and as the temperature is exactly in proportion to the respiration, it must be equally necessary to perfect respiration.

8. So long as we regard those diseases as pathological, to be remedied by officious interneddling, they will be opprobria of

the healing art; and conversely, whenever we strike at the true cause of the impurity of the blood, viz., imperfect assimilation, to be remedied by careful attention to physiological processes, the practice will be successful.

Having sufficiently elaborated these propositions in my former article, I shall now proceed to show how admirably the Doctor's practice corresponds to them.

The patient, inhaling the warm vapor, applies, as it were, a warm fomentation to all the inflamed surfaces around the tuberculous depositions, and in a short time they are healed. Drinking the hot, worm-destroying, scurvy-curing, teeth-whitening, dextrogyrate cane-juice, furnishes, at one extreme, the best quality of food for the formation of healthy chyle. At the other extreme, the patient, enveloped in the dense vapor, is in a vapor-bath, and the skin is kept in full, healthy action, while the two means, digestion and respiration, being perfectly performed, all the chyle is assimilated, and the resulting equation from the four proportional quantities, good food, healthy digestion, perfect respiration, and healthy action of the skin, is purity of blood = no tuberculous depositions.

If these proportionals can be obtained in any other situation than a sugar-house, the same results will follow; and the reason why hatters are not equally cured of consumption is because the above proportions are not obtained. They have not such food; neither are they enveloped so entirely in the vapor; and the consequence is, merely their colds are cured.

The year 1841 I passed at a place where there was a manufactory of copperas, and I noticed whenever the hands, from a Sunday jaunt, took cold, the cough and pain in the breast were promptly cured on going over the kettles on Monday. One of the workmen, of a highly-marked consumptive family, was in bad health, very dyspeptic, with frequent pains in his breast; and his friend, well acquainted with all the family, remarked to me, "J. is going like the rest of his family; they all die about his age, and he will be lucky if he lasts two years. But J., instead of going off like the rest of his family, became so vigorous while over the kettles, (losing his dyspepsia and pain in the breast) that he could eat anything and stand any exposure without inconvenience, and is yet in the land of the living, having stood the the wear and tear of more than a dozen years since. I therefore conclude the warm vapor is far more effective than any specific virtue in the volatile aroma.

As far as my own opinion is concerned, I would just as soon

look for some specific virtue in the volatile aroma from the copperas kettles, as from the sugar kettles.

With all due deference to the Doctor's skill and learning, I would beg leave to suggest there is another property of the warm vapor he has overlooked, as well as its soothing, healing properties. Steam has very high solvent powers, and it is extremely probable it assists very materially, in dissolving the tuberculous depositions with which it may come in contact; and I have no doubt, if he would condescend to examine the properties of the steam, the twin-sister of that volatile aroma supposed to contain the specific virtue, he would find that homely sisters are always the best.

The above views being proved to be correct, an unavoidable conclusion is, that noxious medicated vapors will never be sufficient to purify the blood any better than medicated cough syrups and balsams. The only inhalation that will be found useful, will be the simple vapor of water, which, being equivalent to the celebrated water-dressing, will prove soothing to the lungs, and relieve the inflammation excited around the tubercles; while, in addition, good food, healthy digestion, healthy action of the skin, perfect respiration and its concomitant, perfect assimilation, will insure a complete cure, unless the system is too much worn out to be ever cured.

If the theory of a disease is correct, the practice clearly deducible, if judiciously carried out, ought to be successful. In my former article, I showed clearly, by Dr. Norcom's letter, that my propositions were successful when carried out in practice; and now I think I show more clearly still, that Dr. Cartwright's practice is precisely in harmony with them; and as his practice is also successful, I therefore contend that "*Quod erat demonstrandum*" should be written below the propositions.

Were I asked, "Can the four proportionals, good food, healthy digestion, perfect respiration, healthy action of the skin, and the resulting equation, purity of blood=no tuberculous depositions—be obtained, elsewhere than in a sugar-house?" I should unhesitatingly answer in the affirmative; though whether as good food can be obtained, as the worm-destroying, scurvy-curing, teeth-whitening, dextrogyrate cane-juice, remains to be tested by further experiments.

From my observations in regard to hatters and copperas-boilers, I am confident future investigations will show that a trip to Louisiana will not be necessary to cure tuberculous cases.

Dr. Cartwright's extremely able and interesting articles, will also give you many useful and important hints in practice,

should you feel inclined to carry out these indications. The Doctor's sound judgment led him to the right practice, though his great scientific knowledge naturally led him to expect some extraordinary "specific virtue in the volatile aroma" from the sugar kettles, that would neutralize the "acrimonious humors" as effectually as alkalies would acids, and thereby led him astray, if the opinion of your humble servant is correct.

If the above views of tuberculous depositions, and the necessary deductions for their prevention, sustained as they are by the Doctor's successful treatment of them when already developed, would induce people to carry them out in every-day life, those diseases might, with due care, be eradicated as thoroughly as small-pox by curing the cases on hand, thereby preventing any further hereditary transmission, and by raising children so as to prevent the development of new cases. But the love of the complex and abhorrence of the simple, which have ever been the bane of medical practice, will prevent their reception. The same love for the complex and abhorrence of the simple, exists in the people as well as the profession; and an explanation of consumption and scrofula, filled with scientific technicalities and formulas, that would require severe study to comprehend them, would receive far more favor from all, than anything your humble servant has written. But, nevertheless, I present my views to put on file, confidently believing some investigating mind will take them up in course of time, and elaborate them more successfully.

While this treatise was in press, the following article in the Buffalo Medical Journal, edited by one of the most talented and distinguished physicians in the country, came to hand. It confirms in a remarkable degree, the truth of the propositions advanced, and by showing that the plan of treatment is successful, gives it the very best praise than can be given any plan of practice:—

"The perusal of an article by Dr. B. H. Washington, of Hannibal, Missouri, published in the Nashville Journal of Medicine and Surgery, reminds us that we have perhaps, been negligent of our duty as a Journalist, in not insisting sufficiently upon the value of the new ideas of the pathology and treatment of consumption, which are now usurping previous notions. The contrast between the two ideas of treatment, is a marked one. The venesection, the emetic, the blister, the iodine inhalation,

the careful protection from air, and from exertion, the abstinence from animal food and from stimulating drinks, incident to our former ideas, have given place to active exercise, to fat meats, and hearty diet, to vinous and alcoholic stimulants, and to what would once have been deemed, reckless exposure to vicissitudes of weather.

"'I've been bleeding from the lungs since I saw you,' said a medical friend as he entered our office, and in reply to our inquiries as to what he had done for it, he answered cooly, 'drinking whisky punch!' He followed up this pleasant remedy in moderation, and as far as we know, had no return of his attack. In another instance, a friend, also a medical man, bled profusely, in the city of New York, when just upon the eve of an Atlantic voyage.

"Feeble and emaciated, he insisted on accomplishing his purpose, and sailed for London. He reached there in a very much improved condition, but was again attacked by alarming bleedings. He kept his bed for a fortnight, taking little medicine save morphine. As soon as his health would permit, he started on his return voyage, as a medical officer of a full emigrant ship; though still in a very exhausted condition. The faithful performance of his duty, in enforcing cleanliness in the steerage, and driving the emigrants daily on deck, during a long, rough passage, required a great deal of physical exertion and exposure, with constant occupation of mind. When he reached New York again, he was in unusually good health and flesh, and had the satisfaction of landing one more passenger than he took on board; no deaths and one birth having occurred on the passage.

"In still another, a gentleman who had had cough and purulent expectoration for some months, which had gradually developed the sequelæ of night sweats and emaciation, came under our care. He presented, on physical exploration, marked dullness over the left infra-clavicular region, with a hard and rough respiratory murmur. During a period of two years, since that time, he has traveled much, been extremely reckless of exposure, and drank alcoholic liquors in moderation. His diet was generous, fat food being particularly enjoined. We saw him lately, looking as robust and well as ever.

"We could multiply cases. Even in those far advanced in disease, we have never failed to witness more or less improvement as the result of this regimen. If it is the most promising of cure to the curable patient, it is also the most conducive of comfort in the incurable. We do not intend to discuss the

pathology of the disease, or the rationale of the treatment in this hasty sketch. We wish only to declare our full conviction of the merits of the tonic treatment.

"The term *exercise*, in this connection, does not mean a gentle ride in a carriage on a pleasant day; it means *hardship*, positive hard work, involving fatigue and consequent good appetite, easy digestion and sound sleep.

"Neither should the patient avoid exposure to vicissitudes of weather, at the expense of his digestive organs. It is far better to get wet in a storm, than to sit all day by the coal grate, and get a headache and loss of appetite thereby. It is infinitely better to take cold than to grow dyspeptic. We have not stated this too strongly. We are perfectly aware that, aside from the few cases mentioned, we have not advanced an argument in favor of the treatment. But we have stated, concisely, what the treatment is, and what may be expected from it; and there we leave it to the consideration of our readers."

RESPIRATION AND CIRCULATION.

[The influence of the respiration on the circulation of the blood is investigated in the following pages; and when the reader gets through them, he will no doubt cheerfully agree in the opinion, that the importance of perfectly healty respiration is incalculable.]

REPLY TO "JUSTICIA."

Dear Doctor: — Please to allow me, if not too wearisome to your readers, to reply to the criticism of "Justicia" on my article in the June number. In reference to my warm support of the Willardian theory, I would merely remark, that I think, talk, write, and act *in earnest*, and would not give a fig for any listless, poke-easy body. Full seven tenths of the cases in my practice, have been sick entirely unnecessarily; and so often have I, with my heart's warmest sympathies deeply moved, stood by the side of a patient writhing in agony from ignorance of the laws of health, that I cannot but feel interested when I see a prospect of being able to arouse attention enough in those who read, to induce them to act.

For years have I labored to extend physiological knowledge

amongst my friends, for the purpose of preventing premature disease and death; but the effort to excite interest was almost unavailing. And as for the masses ever being induced to attend to the subject, my only hope of that, was in the dim vista of the future, through which the promised millenium loomed up: but now, with such an "Open Sesame" to physiological and pathological arcana, I can take my countrymen into the Kingdom of Nature, and draw their minds from the contemplation of the "almighty dollar" to the observation of the valuable truths laid before them; and they will go home excited, deeply interested, and prepared to carry out in practice the truths thus brought to their notice: for I have yet to find the first mind uninterested in the development of the theory, and the necessary deductions, whether believing them or not; and it is because I view it as a lever by which the profession, if at all united, could move the masses to action on the subject, that I feel so much interestad in the investigation.

For instance, to every consumptive parent, now looking forward with gloomy forebodings for the bright cheek of his lovely daughter to be wasted by hectic fever, when we whisper in his ear, "Grieve not, the lungs are an eliminating organ that will, with due care, expel the poison from her system, and enable her to bloom like a hardy perennial," we pour into his aching bosom a balm of Gilead that will soothe his sadness; and we take such a grasp on his very heart's core, that we can lead him irresistibly, by his love of his offspring, to study the laws of health, and to see that his daughter is trained in accordance with them. As long as you teach A, B, C, and D that the circulation is carried on by the heart, independent of respiration, you may as well preach to so many stumps, as to talk to them of the importance of breathing pure air, or of ventilating their residences, churches, halls, &c. Just so long as they believe the office of respiration is merely to keep them warm, by the combustion of a few superfluous ounces of carbon, they will continue to congregate, breathing hot, dry, vitiated air, contaminated by the compound fumes of tobacco, whisky, odors from scrofulous lungs, and dyspeptic stomachs; and foul cellars, unventilated bed-rooms, bar-rooms, school-rooms, churches, theaters, &c., will continue to be the foci of disease and death. But when you teach them that animal heat, circulation, and, by consequence, innervation, digestion—in truth, that the functions of all the different organs are dependent on respiration, you command their attention at once, and the full importance of pure air and proper ventilation, strikes their minds with irresistible

force, and you have a long and powerful lever, by which you can move them to action for their own benefit; and we may confidently look forward with bright anticipations to a better day, when the millions now prematurely dying from violated physiological laws, will be saved to bless the world with their labors; when the mother, instead of pining away in corroding grief for the loss of her cherub, will watch with thrilling delight its development; when the eye of genius will only be dimmed by old age; in short, when Young America shall stand forth before the world, to show what can be done for the development of man under a free government. If the moral effect of our development thus far, under our noble government, has been so great as to make many a throne totter, what may we not expect will be the effect of our full physical and intellectual development? We now number twenty-five millions; within the last twenty years as many millions have died unnecessarily, and entirely because they lived themselves, and caused their children to live, in ignorance of, and in violation of physiological laws, upon which the enjoyment of health depends. Could those twenty-five millions have been saved by a knowledge of the laws of health, the land would now be swarming with fifty millions of freemen; and the moral effect of such a development of man, would be incalculable. I cannot but think that America was, under the providence of God, held in reserve until the proper time, to be a grand pioneer to guide the world into those glorious civil, social, physical, intellectual and moral improvements, that will enable man to stand forth in the full majesty of his God-like nature; aye, even greater than he was when "forth he walked amid creation's garden, to the sound of all its stirring music:" and thus thinking, sure am I, no other stimulus than the belief that this view of respiration, and its concomitants, will be the means of saving thousands of soldiers to urge onward the banner of freedom, is necessary to make me plead in earnest for it.

While lying sleepless a few nights since, my imagination took a wild flight into the dark realms of the future; but, like Noah's dove, finding no resting-place for the sole of her foot, she was fain to return to the ark of memory, where she refreshed herself, turning over and examining the tablets saved, while floating down the current of life. Many minutes thus were passed, my heart, chameleon-like, all the while answering to each page: now quickly beating, as a bright page betokened gladness, now slowly and faintly beating, as a blotted page indicated the tear of sadness. At length, one was found on which

were deeply graven the lineaments of the fondly-loved face of a mother, long since gone to the spirit-land: and as I gazed, she stood out life-like: there were the deep furrows placed in her once smooth cheek by premature suffering; and as I attempted to grasp her long and shrunken fingers, the thought, unnecessarily is she gone, wrung my heart with bitter grief, and I resolved to labor more strenuously than ever, to prevent the untimely severance of those tender ties that bind parent and child, brother and sister, husband and wife, in sweet harmony; you may therefore count on me as "listed for the war," and I shall be invulnerable to all bullets except those fired from a good old-fashioned Baconian gun, well charged, without a single incompatible in the powder; and when mortally wounded by such a gun, I will give up the ghost with the best grace I can, and hope he will have placed over me, "An untimely death from a mistaken zeal for the cause of humanity."

Though I may be ridiculed and pronounced enthusiastic, fanatical, or crack-brained, it will be a small matter. I am willing to bide the result, and let time show whether I am mistaken in my estimate of the importance of this theory. In the hope that "Justicia" will, upon reconsideration, alter his views, I will now proceed to examine his arguments.

He admits that the lungs are in a vacuum, but denies that the blood is; for, says he, "we know that in order that it might be oxydized, *it must come in contact with atmospheric air*, and thus the caloric, which is generated by the combination of the carbon of the blood with the oxygen of the air, is far below the requisite temperature, being as 98° to 212°, the common boiling point of water."

The statement that the air must come *in contact with the blood* is news to me, and I must deny it *in toto*, and call for the proof. In my younger days, I was taught that membranes could be permeated readily by gases alone, while they were almost impermeable to air. This supposition of the actual contact of the air with blood, contradicts the law for the diffusion of gases, and, moreover, contradicts fact itself, as stated by surgeons for two hundred years: for they assert that air admitted into the jugular veins causes death. Now I should like to know why, if air admitted into the jugular vein destroys life as soon as it reaches the chest, air admitted through the coats of the vessels *to come into contact with the blood* in the chest itself, will not with equal certainty destroy life? Inasmuch, then, as "Justicia's" assertion, that air must come in contact with the blood, contradicts the laws for the diffusion

of gases, and the voice of surgeons for two hundred years, I hope he will lay before us the proof: he no doubt has proof with which I am not familiar. Let us examine this admission of air into the jugular veins. If we have a lock, and out of a hundred keys, one alone will fit it and work smoothly, common sense will tell us to take that for use. Now let us apply the same common sense to the interpretation of physical phenomena. The unanimous voice of surgeons for about two hundred years, describes the sound produced by the admission of air into the incision, as a SUCKING, GURGLING sound; and where, from the favorable situation of parts, the admission of air was rapid, a hissing sound is produced. Numerous suggestions have been made, why the air should thus rush in and produce that peculiar sound, but none of them will fit the lock. Now if we say, that the sucking sound was produced by the air rushing into a vacuum in the chest, we have a key that will fit the lock and work with remarkable smoothness, so much so that common sense will tell us to keep it and use it. If the diaphragm was contracted, and the chest expanded, the vacuum would be greater, and the air would rush in with that peculiar *hissing* sound always produced by air rushing rapidly through a fluid into a vacuum; such, for instance, as we always hear when traveling along a miry road, and the horse withdraws his foot after sinking it in the mud and water. If the vacuum was in the head, the air would go there as into an inverted bottle. No one can rationally explain why the air always goes to the chest with that sucking sound upon any other supposition. Wetstein, I think, in the seventeenth century, killed an ox by injecting air into the veins; and since his time the attention of surgeons has been particularly called to it: and yet, in all the surgical works since that time, not a single key can be found that will fit the lock, like the simple explanation that the remarkable sucking or hissing sound is produced by the air rushing into a vacuum; and the common sense of mankind will sustain me in saying it is the true interpretation; so that, twist and turn it whatever way you please, the theory is always found to harmonize with, and give a rational explanation of, facts.

Concerning this vacuum of the lungs, let me be understood; if, when with a knife I make an incision into the thorax so as admit air more freely than through the windpipe, the lungs collapse and death results, all will tell me the reason the man died was, that the vacuum of the lungs was destroyed, and he could no longer use them. Very good, if with the same knife I make an incision into the jugular vein, and the air rushes in

and goes directly to the chest, with a sucking, gurgling, or hissing sound, such as we invariably hear when a horse draws his foot out of the mud and water, I apply the same logic, and also say there was a vacuum, and especially as I produce death with equal certainty. Some will contend, death is produced solely by the admission of air into the heart; though I grant that, yet there will be no conflict, for no one contends the heart has nothing to do with the circulation, but it is, as I shall soon show, an important and indispensable auxiliary to the lungs.

It seems to me the real *modus operandi* of respiration has been overlooked by many physiologists—let us examine a little more closely: the lungs of a dead person present a mottled appearance, the blood that was arterial not having been decomposed, remains arterial still, and though the pleurae are remarkably thin indeed, yet no change of venous to arterial blood takes place, though exposed to air. There is no passage of oxygen through the membranes; cut them open and admit air into direct contact with the blood, and no change takes place, nor does actual contact of air with venous blood change it thoroughly to arterial, as all know who have witnessed venesection. Some suppose a slight change of color, which sometimes takes place upon making an incision into the lungs, is owing to the contact of air, but close observation will show that it is owing to the exudation of the arterial blood, which existed in the lungs at death, and is forced out by the increasing collapse of the lungs resulting from the incision. It is generally supposed, that oxygen passes readily through the membranes at all points: this I maintain, is a mistake. The change of color in the blood, supposed to denote perfect oxygenation, is effected by so many agents, that at present, the most reasonable opinion concerning it, according to Carpenter, is that it depends more on a change of *form* in the blood corpuscles, than upon any change in their internal composition: blood deprived of fibrine, will be changed to a bright red by the addition of milk, oil, or powdered chalk, or gypsum: heat will also change venous blood to a bright red color, and the change of color cannot be considered as proof that perfect oxygenation of blood has occurred. One would suppose from reading some authors, that such is the affinity of oxygen for the carbon of the blood, it would rush through the membranes in the lungs, without the slightest difficulty, and that not a particle of venous blood would remain venous, whenever air could come in actual contact with it: and yet the affinity is so moderate that arterial blood, when exposed to air, will assume the venous hue after standing some time, and the clot of venous

blood, is so far from being promptly and thoroughly changed to arterial by the actual contact of air, that only a slight superficial change of color is perceived, and even that is not perceivable, unless there is serum on the clot.

It being a well known fact that, throughout the whole animal kingdom, vigor of life is in ratio to the consumption of oxygen, it is very evident to my mind that every facility must be afforded in the lungs for the passage of the oxygen; for the large amount needed by man, could never be furnished unless oxygenation occurred much more rapidly than it does, when air is admitted into actual contact with venous blood. In confirmation of this view, we find that those animals, in which oxygenation is supposed to be effected by the direct contact of air with the blood, range lowest in the scale, and as we rise higher, more efficient and more complicated means are provided.

As before specified, actual contact of air with the clot of venous blood produces only a slight superficial change in the color, and not even then is it perceivable, unless there is serum on the clot, and yet, in the lungs a large amount of oxygen is by some means or other sifted out of the air, if I may so speak, to combine with the venous blood; it cannot be attributed solely to vital agency, for the change can be effected in the lungs while out of the body, at least so far as any change of color can be considered proof.

Now, bearing in mind the law for the diffusion of gases, let us inflate the collapsed lungs, and watch the process, it is impossible for the air to pass through the small air cells without distending them considerably, and at innumerable points, that distention cuts for an instant the current of blood in the adjoining blood vessel, and the coat of the blood vessel resuming by its natural elasticity its proper shape, a slight vacuum is formed beneath, at the point of interruption, and the oxygen, there being no opposing fluid beneath, can shoot through the free humid membrane, and the pure oxygen, thus brought in actual contact with the blood, effects a far more rapid oxygenation than can possibly be effected by direct exposure of the blood to air: while in other parts, the carbonic acid, which will not come out readily unless liquified, can be liquified so as to pass out into the bronchial cells: here we have an extraordinary harmonizing of two conflicting laws.

The area of free humid membrane for the passage of oxygen is still further extended by another step in the process, yet to be elucidated.

And even in those animals unprovided with lungs, we find

aeration of the blood provided for, by the continual corrugation or motion of the skin or membranes, and in birds with a slightly movable thorax, we find a continual vibratory motion, so that if time and space allowed, comparative anatomy and physiology would be found to harmonize with this theory.

To my mind the proof is satisfactory, and the conclusion that some portion of the lungs works in a vacuum, though air is admitted into the bronchial cells, seems perfectly legitimate from the premises, and I therefore contend, that air cannot come in actual contact with the blood in the chest without producing death. During twenty years reading, I have never met with such a strange thing, as a false theory harmonizing with so many facts, and giving a rational, consistent explanation of them: and yet, this false theory, as some would have it, explains clearly a great number, both of physiological and pathological phenomena, and is not found to conflict in a single instance, with any known law of nature: in truth, it will enable us to take a more correct view of the heart itself, and bring it into harmony with the laws of nature.

Upon the supposition that the heart is the motor power, it violates the laws of mechanics as taught in works of Natural Philosophy; for it is not attached to bones which serve as levers and fulcra, as are all the other muscles, required to be of any material service. John Bell says "it is awful to think of the unfixed position of the heart;" and Dr. Arnott, certainly good authority in mechanics, says, "the heart alone is the rugged anomaly, the signal deviation from the ascertained laws of fitness in mechanics;" then why, in the name of reason, should we insist that the heart is the motor power, in utter violation of the laws of fitness, when we have a far better explanation, and one that will bring the heart itself in harmony with those laws?

As such another anomaly as the heart, cannot be found in all the wide world, it is more reasonable to conclude that man has erred in assigning it a duty more than it is able to perform, than that the Creator erred in making it: we must therefore assign to it a lighter duty, and one that will bring it in harmony with the laws of fitness. The heart is surrounded by bones, and admirably situated for attachment to them, to obtain the necessary leverage, but as it is not thus attached, the reasonable conclusion is, that it is not intended as the motor power. It is a well established fact, that for the healthy performance of the functions of the nervous system, a due and regular supply of blood is necessary: whatever, then, may be the motor power, a regular supply should be afforded. If the lungs were the sole

motor power, the motion of the blood would be very irregular, because the motor would be irregular: for instance, in strong muscular efforts, we are obliged to hold our breath, and upon catching it again, the blood would rush onward like water bursting through a barrier. The lungs alone cannot afford that due and regular supply, we must therefore look for an assistant that can work regularly. The heart is a strong sphincter muscle, acting regularly, and independently of the lungs, surrounding the tube containing the circulating medium, and by its compartments, is admirably situated for measuring out a regular portion at every contraction, we may therefore conclude the office of the heart is to regulate the flow of blood: this brings the system in strict harmony with the laws of fitness in mechanics, by assigning to the heart no more than it can perform; with the laws of hydraulics, by showing the motor power is where it ought to be in a continuous tube, namely, between the engorgement and vacuum in the lungs: and lastly, in harmony with chemical laws concerning the expansion of fluids upon the application of heat; such a view certainly is more worthy of consideration, than one that requires us to see the laws of mechanics, hydraulics, and chemistry, violated in our system. Lest some careless phrase may be misunderstood, allow me to say I do not contend that the heart has nothing to do with the circulation, but write with the above view in my mind.

But I must not wander from the subject—"Justicia" cannot reconcile his assertion, that the blood must come in contact with the air, with the fact that the admission of air causes death instead of continuing life: while on the other hand, the fact completely harmonizes with and sustains my position. The next item is the boiling point of water in a vacuum. I wrote it 67° and the compositor made it 57°, and also made some eight or ten other mistakes, for which, however, I am more to blame than he is, for I wrote hurriedly. Upon page 56, Graham's Chemistry, the boiling point is stated at 67°, so that "Justicia" will find I was nearer up with the times than he was, in putting it at 72°; *old* authorities put it at 72°, but later at 67°.

"Justicia" says, "I will not deny but that the blood is heated in its pasage through the lungs, yet I do say that its volume is not increased in the smallest degree; for we all know the ill effects arising from a small increase of the blood in the circulating system." This is founded upon a misapprehension of the theory entirely; I do not assert that there is an actual increase in the quantity of the blood in the system, but that in the lungs, a portion of it is expanded, and that it rushes out

through the proper vessels, while the loss of caloric by radiation, and the evaporation of the perspiration, quickly reduces the expanded volume of blood back to its usual size, so that we have a beautiful round of expansion and condensation, without the production of any of those ill effects resulting from plethora; therefore the objection, that ill effects arise from an increase of the volume of the blood in the circulating system, avails nothing, because the theory does not teach that there is any actual increase, and it must therefore be stored away for use against some theory that does so teach.

His fear of a fatal explosion from a great increase in the volume of blood, is entirly groundless, because there is a way provided for the expanded blood to escape, and that is through the pulmonary veins: if the blood was stopped up in the lungs, and then expanded, an explosion would result, but his fears are founded upon a misapprehension of the subject; after he reviews it, he will be able to look even upon me, without expecting to see me exploded to atoms. His calculation of the 32 lbs. of blood being increased 1728 times, might suit some other writer: but certainly cannot be considered an argument against my position, for there is not a word in my article about the whole volume of blood being increased 1728 times; he has written upon a hasty examination, and I doubt not he will, upon a reconsideration, view the subject with more favor.

His next point is, "admitting that a stoppage will cause stagnation immediately behind, and a vacuum before the obstacle: and that this stagnation in the blood is on the right side of the septum of the heart, and the vacuum immediately on the left side, I say therefore, that the blood must have been stopped in the heart."

There is a slight difference between us; Justicia is looking at an anatomical heart dissected out, with its chambers on the right and left side of the septum; I look at the physiological heart, with the lungs interposed between the right and left side, and as we are discussing a physiological subject, I must insist that it is not a strictly logical view of the subject; and is moreover founded on a forgetfulness of anatomical facts which destroys its force.

I have not studied anatomy for 8 or 10 years, and have not the proper works at hand, but as my memory generally serves me well, I must rely upon it, and say that upon dissection the right side of the heart, and the* *pulmonary arteries leading to the lungs*, are found gorged with blood, and the *pulmonary veins leading from the lungs*, and to the left side of the heart,

* Carpenter's Physiology.

are empty. "Justicia" unthoughtedly asks, "If the blood was stopped in its passge throug the lungs, why was not this division between stagnation and vacuum, in the lungs?" The true statement of facts, shows conclusively that Justicia argues against himself, as all persons do who are on the wrong side. I have no doubt, when he re-examines the proper works for an answer to his question, he will say, I have checkmated myself, and must henceforth go hand in hand with Dr. W. in defending such an important theory.

Now, while we are on this subject, let us review Mr. Boinet's case.

"The heart had ceased to beat, the most complete relaxation of the frame existed, the pallor was extreme, in fact, all the characteristics of death had made their appearance. For five minutes, cold water, ammonia, slapping, &c., were used with the greatest solicitude, but all in vain, and the patient was declared dead."

Now, there can be two assumptions concerning this case; I will assume that the pulmonary veins were empty, as they are always found to be, upon dissection, and that upon the assumption of respiration from insufflation, the circulation commenced again, because the blood was expanded by the heat thus generated, and quietly glided on its course through the pulmonary veins to the heart, which consequently resumed its pulsations; this is a beautiful and rational explanation, in strict harmony with anatomical facts, and the well known laws of nature.

If this assumption be admitted, no further proof of the theory is needed, and as "Justicia" may not be disposed to admit it, let us examine his side: he can assume that the pulmonary veins were *not* empty, but that they, as well as the pulmonary arteries, were full. Suppose we admit it, now how did it happen that the heart commenced beating?—without the stimulus of properly arterialized blood, the ordinary theory of circulation cannot be sustained for a single moment, with any plausibility; and no man can rationally explain how the newly arterialized blood got to the heart to stimulate it to contraction.

The assumption that the pulmonary veins were not empty, does not help the case—let us consider what took place; for five minutes the patient was pulseless and declared dead, and for some time longer, insufflation was tried without success, but at last, a successful breathing effort took place from insufflation; the pulmonary arteries are gorged with venous blood, as also the pulmonary veins per assumption, now how will the newly arterialized blood get the venous blood out of its way, to reach

the heart? it cannot move itself, and the heart cannot contract because there is no stimulus—according to Carpenter, "the heart had ceased to pulsate from two causes acting on the two sides: on the right it was the result of over distension of the walls of the ventricle, owing to the accumulation of venous blood; and on the left, to deficiency of stimulus necessary to excite the movement"—now let "Justicia" get the stimulus to the heart if he can; I think he will be glad to take Mrs. Willard's theory, and trace it through the pulmonary veins.

The following proof is remarkable.

When a boy, I often noticed, that if in slaughtering animals the windpipe was cut, scarcely any hemorrhage resulted; while if that was left untouched, full hemorrhage occurred. This fact was stored away in my memory for future investigation; but no physiological work in the scope of my reading, gave me any light on the subject.

As soon as the idea was suggested, that the motive power was in the lungs, and not in the heart, a broad flash of light poured into my mind, and the tormenting darkness, in which I had been groping for many years, took its flight; the fact was readily susceptible of explanation; the blood filling the windpipe, quickly suspended respiration, and as a matter of course, the impelling power of the blood was suspended also, and the hemorrhage ceased. The engine could not work without steam.

When the windpipe was not cut, respiration went on, and kept up the circulation of the blood, until the animal was nearly entirely exsanguineous; the *motive* power kept the apparatus in motion until the waning powers of life gave way, and death, commencing at the brain, and involving the nervous system, producing convulsions, ended the scene. The ordinary supposition, that the motive power is in the heart, fails entirely to explain the phenomena: and they are perfecty incomprehensible, unless the new theory is received.

Another fact, strongly confirmatory of the theory, has also accidentally fallen under my observation,—a fact, for the satisfactory explanation of which, my researches have likewise proved fruitless; it is this: That in some animals if the incision be made deep enough to cut the pneumo-gastric nerve, the hemorrhage will cease still more quickly, than if the animal has to undergo the process of strangulation by filling the windpipe with blood. This is undoubtedly owing to respiration being suspended sooner; and the motive power being withdrawn, hemorrhage cannot occur, because the blood is not impelled to the orifice.

These two facts give strong confirmation to the theory: and they, in return, receive a clear explanation from the light it affords.

Every physician in the land can easily satisfy himself of the truth of them, by performing the experiments above indicated

I have not performed a series of experiments to decide the matter more thoroughly, for the facts were stored away in my memory, merely awaiting for light, like Daguerreotype plates: and Mrs. Willard, a fair and brilliant sun, having given that light, full, clear, beautiful, and indelible pictures have been taken.

How beautifully does the theory harmonize with the declaration in Genesis ii. 7: "And the Lord God formed man of the dust of the ground, and *breathed* into his nostrils the breath of life, and man became a living soul;" and how much more striking the description of the formation of man when viewed through the light thus afforded. There was an extraordinary apparatus, than which a more complicated has never yet fallen under the cognizance of man. The motive power was wanting: and at a mere *breath* from Him whose powerful Word had brought forth light, the whole started in harmonious action, and man, the God-like, stood forth a living soul. How simple the means! how grand the results! Rich food for meditation to the thoughtful.

[Since we received the paper of Dr. Washington, we have put ourself to the trouble of making pretty extensive inquiry, among those who know, whether it be a *fact* or not, that cutting the windpipe prevents a slaughtered animal from bleeding. *All* have answered us that it was an indisputable fact. We inquired if the great veins of the neck were divided *after* the windpipe was cut—would not these veins bleed freely? We was answered, "That if the windpipe be cut, you might as well afterwards try to get blood out of a turnip as from any part of the animal; and that even should the heart be split open, it will not bleed." We visited an old stock-raiser, a man of learning and extensive information, and noted for the closeness of his observation. He agreed with the butchers, saying emphatically, "If you cut the windpipe, *and let blood into it*, the animal will not bleed; you cannot make him bleed, no matter where you cut or stab." And he added, "Why, sir, everybody knows that."—Ed. Nash. Jour. Med.]

Let us now examine his numbered items. In the first, concerning the production of heat by the combination of oxygen and carbon, we both agree.

2d. "The blood must therefore receive caloric at the lungs by the combustion of one of its principal elements, which loss is balanced by its expansion from the *small* portion of caloric it receives."

"Justicia" has studied medicine more than book-keeping, so he has entered the balance on the wrong side; when corrected, it will read quite differently. Carpenter says somewhere, page not recollected, that there can be no doubt that there is a surplus of oxygen absorbed into the system; his argument ought to read, therefore, "which loss is more than balanced by the absorption of a surplus of oxygen;" thus I have the advantage yet, by all the heat evolved.

Liebig's Animal Chemistry teaches that about 13.9 oz. carbon are converted into carbonic acid daily, and they evolve 197477.3° of heat. "Justicia" says the loss of carbon is balanced by its expansion from the SMALL quantity of caloric it receives. If he thinks 197477.3° of heat a small quantity, I should like exceedingly to know what he thinks a *large* quantity is. He has very singular ideas of quantity, or his memory failed him when he was making up his balance sheet. A corrected balance sheet will read as follows:

ANIMAL ECONOMY.

Dr.	Cr.
To amount carbon 13.9 oz. expended.	By a surplus of oxygen, per Carpenter. By 197477.3° of heat, per Liebig.

With that balance sheet, I am willing to continue business, but think "Justicia" had better wind up.

3d. "All anatomists agree that the lungs are in vacuo, but deny that the blood is in vacuo when it is heated, since this caloric is produced by the presence of atmospheric air." I have shown that the presence of atmospheric air in the blood produces death, ergo the blood is in vacuo, as clearly proved by the patient dropping dead as soon as that vacuum is destroyed. *Vide* surgical works.

The fourth item I will pass over; merely objecting to his statement the blood is not in vacuo.

5th. "They (chemists) also teach that one volume of water converted into vapor, is increased to at least 1684 volumes; some authorities say 1728, but they do not teach that the blood is increased 1728 times by boiling;" nor does any one else in my knowledge. I only contend that a small quantity at a time,

of the watery portion of the blood is converted into vapor, and that it is quickly condensed again, so that no inconvenience is felt, much less a fatal explosion, as "Justicia" supposes. I cannot see why there should be such a strong objection, to this conversion of a small part of the watery portion of the blood into vapor, in the vacuum of the lungs, when it harmonizes with well-known chemical laws, and we have so much clearer an explanation of the whole process than by the ordinary theory. To my mind it was the most striking point of all. In the first place, it harmonizes with the analysis of the blood: it is not a saturated solution of any of its constituents, so that a part of it could be converted into vapor without depositing any superabundant salts, as would be necessary under the laws of vaporization, and this conversion of a part into vapor, the vital forces could regulate just as readily as they could the secretion of the gastric juice or the bile.

In the second place, it harmonizes with the fact that a dense volume of vapor is always thrown off, upon the insertion of a knife into the throat of a squeaking porker, while from a wound in the extremities, little if any vapor is ever seen to arise.

In the next place, the law for the diffusion of gases is not violated, as it is by the ordinary theory. It is a well established fact that the thinnest film of *water or any liquid*, is absolutely impermeable to a gas as such, (V. Graham's Chemistry, p. 74,) and that in a diffusion tube it is necessary to avoid wetting the plate of plaster of Paris, for if that is done, the passage of the gas is stopped. Upon the supposition that blood flows in its ordinary fluid state, the various membranes or coats of vessels are nearly absolutely impermeable, because they are lined with the fluid blood, and only such gases will pass as have a great affinity for water, and will be immediately liquified; and the only way we can suppose oxygen will readily go through such a membrane, is by making it an anomaly like the heart, for it is so sparingly soluble in water, that when agitated in contact with that fluid, no perceptible diminution of its volume takes place. Carbonic acid has very great affinity for water, but in its gaseous state, scarcely any at all for air, and diffuses itself through air very slowly; for its rapid diffusion into the inspired air in the bronchial cells, *it is absolutely essential* it shall be liquified. Here, then, is a practical difficulty; oxygen cannot be readily liquified; for its rapid diffusion, it must have a clear field and not be obstructed by a film of water or blood. If we suppose a part of the watery portion is converted into vapor in the vacuum of the lungs, the difficulty is removed, and we have a condition of affairs that will allow both

affinities to come into play harmoniously. The area of free humid membrane would be still further extended, and the oxygen would pass through it, without meeting with the great obstruction which absolute fluidity of the blood would interpose, while on the other hand, there would be moisture enough to liquify carbonic acid, and enable it to pass out readily to the inspired air in the bronchial cells, into which it would otherwise pass with remarkable slowness: too slow, indeed, to be compatible with life. And the area of free humid membrane being necessarily, from the very nature of things, considerably limited, compared with the rest of the lungs, it tallies with, and explains the fact that only one-sixth of the air inhaled, is consumed.

The conversion of a part of the watery portion of the blood into vapor, also harmonizes with the laws of specific and latent heat. If we suppose the blood still remains in a fluid state, though in a vacuum at 98° its specific heat will be greater than that of vapor, but precisely in proportion as the specific heat of any body, whether liquid or solid, *increases*, so does its facility of receiving or parting with that heat *decrease*, and another practical difficulty presents itself in the way of bringing the system to a proper temperature. The specific heat of water is greater than that of all other bodies, but comparatively few at the present time think of heating a room by tubes filled with hot water, because of the slowness with which it parts with its heat, but steam is used in many manufactories on account of the great facility with which it parts with its heat.

Such is the tenacity with which water retains its heat, that according to Lieut. Maury, the gulf stream travels nearly 700 miles, and loses only two degrees of heat; about 780 parts in 1000 of blood are water, hence the great facility with which the proper temperature of the system is kept up.

But here a great practical difficulty presents itself; precisely in proportion to the tenacity of water in retaining heat, is the difficulty of imparting heat to it, hence, as respiration is slowly performed, only eighteen or twenty times per minute, it would be impossible to heat the blood up to 98, and some plan must be fallen upon to obviate those difficulties and hasten the process of heating. Let us see if we can establish what that plan is.

The latent heat of steam at 98° is 1114°, all of which is given out on condensation, so that from the sensible and latent heat of blood in an æriform state in a vacuum at 98°, we have just as much accomplished for the heating of the system, as could be done by heating the blood up to 212° in the air.

Again, albumen is coagulated at 158°, and its healthy fluidity would be injured at a lower temperature, and it will not do to arrange the system so that its heat will reach near that point, and yet, from the losses by radiation, by heating the inspired air, and by evaporating the perspiration, a very large quantity of heat must be consumed. It will not do to have the circulating medium all fluid, for it will receive and part with its heat too slowly; it will not do to have it all vapor, for such is its facility for parting with its heat, that it will lose it too rapidly and be condensed; it is therefore desirable to have both vapor and fluid, the one to receive and part with its heat rapidly, the other to retain it well, so that the extreme parts of the system will be maintained at a uniform temperature, and yet it is impossible to obtain that vapor freely, because the fluid holding the albumen in solution cannot be boiled under 212°.

How, then, did the Creator solve this intricate problem? By the simplest plan imaginable; he just put the furnace in a vacuum and regulated the combustion at 98°, and the thing was accomplished: the latent heat then of the vapor would be 1114°, which would be given out upon condensation, and precisely as much benefit would be derived from its sensible and latent heat, as if it had been boiled at 212° in the air; in the other parts of the system, the laws of specific heat would come into play, and the blood, in its fluid state, would retain its heat so long, that the extremities of the system would be maintained at a uniform temperature. At 98° the albumen of the blood could never be injured, and on the other hand, it was sufficiently above 67°, the boiling point of water in a vacuum, to render it improbable that from the ordinary unavoidable losses, the combustion would ever get too low for the formation of vapor: the oxygen could then pass readily through the humid membrances without violating the law that a thin film of water or any liquid prevents the passage of a gas as such, while on the other hand there would be moisture enough to liquify carbonic acid, and enable it to pass out readily into the air in the bronchial cells, and finally the 1684 volumes of vapor would clear the track for themselves by sending the blood through the pulmonary veins, and afford a solution to the question, how did the arterialized blood in M. Boinet's case get to the heart?—which question can never be logically solved by Carpenter's theory; and the velocity thus given to the blood will also explain how it is, that substances introduced into the venous circulation, may be detected in the remotest parts of the arterial circulation in animals larger even than man, in less than thirty seconds.

And it is a remarkably significant fact, that those who in

their anxiety to prove the nervous system the sole source of heat, have cut the eighth pair of nerves and have found the animal temperature decreasing therefrom, *always report the death of the animal as occurring when the temperature falls to* 76° or 79°, before even it gets down to the lowest notch for the formation of vapor in a vacuum. If the animal had lived, though the temperature had fallen to 40°, it would be strong proof that no vapor was formed in the lungs, but as we always find the animal dying (provided it is hot-blooded) when the temperature falls so low that no vapor can be formed in the lungs, stronger corroborating testimony could not be easily found.

The next points are the 6th and 7th.

6th. "Physiologists teach that the average temperature of the body is 98°, considerably above the boiling point of water in vacuo, but they do not say that the blood is in vacuo."

7th. "They also teach that a very large proportion of the blood is water, and that this water is in close combination with its other constituents, which would have to be boiled in order to boil the water, and we know that boiling would act rather injuriously on albumen, fibrin," &c.

The legs of the lame are not equal, the 6th is reel-footed and trips up the 7th, for it is a plain case that if the average temperature of the blood is 98°, the albumen in it can never be injured by coming under the law that water boils in a vacuum at 67°; he deceives himself by a play on words, boiling is boiling, but the *effects* of boiling at 212°, and at 67°, are very different indeed. At 212° the albumen would, of course, be coagulated, but at 67° it is self evident the albumen of blood whose average temperature is 98, cannot be coagulated. Error always conflicts with facts, but truth harmonizes with them.

8th. "If the blood expands, it must move. It does not expand in the lungs, consequently the power of motion is not in the lungs." "Justicia" says, "I will not deny but that the blood is heated in its passage through the lungs, yet I do say that its volume is not increased in the smallest degree." I think he had better be content with one such "rugged anomaly" as the heart, if he ships on board such another anomaly as the non-expansibility of the blood when heated, he will inevitably sink his cause.

9th. "Having found ample power to move the blood, are there any facts to show that it does move it? We have found ample power to move the blood—and that this power does move it; but we have found that this power is not in the lungs." To this I will merely reply, it certainly cannot be in that "rugged anomaly" the heart.

10th. "It is a well established law in hydraulics, that if a stoppage of a current occurs, that in advance of the stoppage there will be a vacuum, and behind it an accumulation. We have found this stoppage between vacuum and accumulation, and it is in the heart; therefore, the motor power of the blood is not in the lungs, but in the heart."

This is a slight mistake of the memory, and will be abandoned when he recollects the difference between the anatomical and the physiological heart.

"Justicia's" second article is based upon a misapprension of the subject. I sometimes use the word lungs alone, though I mean the heat generated in the lungs is the motor power, and the use of the word lungs in reference to man, does not bar me from claiming heat as the prime motor, whether it be generated in the lungs, trachea, branchiae, or through the system generally, so his labor is lost. He has found animals without lungs; I can find them without a heart. He claims a substitute for the heart in the peristaltic action of the blood vessels — I claim a substitute for the lungs wherever and however the generation of animal heat may be provided for: we now have accounts balanced, and as I have studied book keeping more than he has, I will enter a credit in favor of the theory by the following fact, Jurine, who on many occasions reduced the Cyclopes to a state of complete asphyxia and restored them to life, found that in the process of re-animation the extremities of the intestinal canal and their supports gave *the first signs of approaching animation*, while the irritability of the heart was less energetic, so that neither in man nor in other animals, does the heart move first in asphyxia. Though the profession was taught the ordinary theory, their strong, sound judgment found it was wrong, and we find upon analysis of the remedial plans for recovery from asphyxia, the leading thought is to make the patient catch her breath, and if "Justicia" had taken one glance deeper, he would have said nothing about the shock to the nervous system starting the heart, for it is in harmony with the theory he is combatting, for the very first effect of the shock to the nervous system is, as before specified, to make patient catch her breath.

In speaking of the fœtal circulation, "Justicia" says, it may be urged that the lungs of the mother are the cause of the circulation. I beg to be excused from taking any such position; "Justicia's" memory failed him again; there is no direct communication with the maternal vessels, and he forgot the structure of the placenta, or he would not have alluded to it. All physiologists teach at present, that respiration and nutrition are performed there, and upon examination of its structure, we find a

considerable resemblance to the lungs. "But there are large vacant spaces or cavities of the interstices of the vessels, which all freely communicate with one another, which have been called the cells, or the cellular, or the spongy structure of the placenta, and have been compared both by Wm. and John Hunter, to the *corpora cavernosa*. As these great vacuities do not resemble cells in any other part of the body, and as some of the most recent and accurate anatomists deny that there are cells in the placenta, to avoid all ambiguity, I shall call these spaces between the vessels the cavernous structure of the placenta." *Lee's Midwifery, p.* 126.

Why should there be no direct communication of fœtal and maternal vessels? Why should the cells of the placenta be entirely different from those found in any other parts of the body? These are questions exceedingly perplexing at first view, but when we consider that more oxygen is absorbed into the system than is consumed in the lungs and is conveyed through the maternal vessels, we have a beautiful explanation of the fœtal circulation. The Creator, who never botches matters, interposed those membranes and cavernous structure of the placenta, to harmonize the circulation with the laws for the diffusion of gases. It was impossible for the mother to carry on the fœtal circulation, for parturition would suspend it and cause death; the fœtal lungs could not be used, for external air could not be admitted: as in the maternal lungs, the oxygen as such would not pass readily in through the wet membrane, and the carbonic acid gas would not pass out readily unless liquified, the cavernous structure of the placenta was interposed to allow the passage of the oxygen from the maternal vessels, while in other parts the carbonic acid would pass readily into the maternal vessels, hence the cells of the placenta (or cavernous structure) as they serve a different purpose are of a different structure from those of all other parts of the body. In the absence of any certain information on this intricate subject, this seems to be as reasonable a conjecture as any other.

According to the best authorities, more oxygen is taken into the system than is actually consumed in the lungs, and that surplus oxygen is disposed of, in other parts of the system, during its circulation through the blood vessels.

The cells of the placenta are of such an entirely different structure from those in other parts of the body, that many anatomists will not admit them to be true cells at all. Now no one can give a good reason why they should be of an entirely different structure, unless they serve an entirely different purpose; and in assigning to them a different purpose, what can

appear to be more reasonable, than to say they are interposed to allow the more ready passage of the surplus oxygen circulating in the maternal vessels, and that the carbonic acid passes from the fœtal to the maternal vessels, and is thrown out through the maternal lungs. As in the adult, lungs are provided to furnish a greater supply of oxygen than could be obtained by the ordinary play of affinities, so likewise in fœtal life, we find an admirable provision to furnish a larger supply of oxygen, and were it not for this provision, the fœtus would certainly rank as low in the scale as the cold-blooded animals.

This hypothesis concerning the oxygenation of the fœtal blood, harmonizes with the law for the diffusion of gases, with the structure of the placenta, with the fact, that a surplus of oxygen circulates through the maternal vessels: with the fact, that robust women, whose duties compel them to lead active lives, and thereby to furnish a liberal supply of oxygen through the free respiration necessary, have healthy children; with the fact, that those females who lead sedentary lives, and therefore furnish a scanty supply of oxygen, have delicate, unhealthy children; with the fact, that those females in the latter stages of consumption, whose lungs are much impaired, have children with systems still more deteriorated. And last, though not the least interesting, it gives us a better insight into the working of the laws for the hereditary transmission of disease, for we can there perceive the same results from defective assimilation that are perceivable in the adult—the development of the fœtus proceeding *pari passu* with the perfection of assimilation through all grades, from perfect assimilation in both mother and fœtus, and consequent perfect development of the latter, to the highly tuberculous lungs in the mother, and greatly impaired assimilation in both, and consequent deposition of tubercles in the fœtal lungs and intestines.

This view of assimilation in the fœtus, will also give us an explanation of that hitherto inexplicable phenomenon, that healthy parents have sometimes had scrofulous children; the mother, though not tuberculous herself, yet, from her habits of life, did not furnish oxygen enough for perfect assimilation in the fœtus, and the necessary result was an unexpected development of scrofulous symptoms in the child—a fact hitherto utterly baffling physiological investigations. But I must not wander off on this deeply interesting and exciting subject.

Had the heart alone been sufficient to keep up the circulation, the placenta would have been perfectly useless; it would only have been necessary to provide a single artery and vein to convey the blood to and from the fœtus, and the fœtal circula-

tion and nutrition could have been quite easily effected: but the Creator, not designing to make "a signal deviation from the laws of fitness in mechanics," as Arnott calls the heart, harmonized his work with the laws of fitness, by providing the placenta to perfom the functions of respiration, circulation, and assimilation. Furthermore, almost all authorities concur in the opinion, that the heart alone is not sufficient to keep up the circulation: hence various auxiliaries have been provided, such as "the elasticity of the arteries," "a certain degree of contraction in the smaller vessels," "a distinct action of the capillaries," "perhaps a contractile action on the part of the veins," Prof. Draper's theory, &c. Now if the heart alone cannot keep up the circulation in the adult, how in the name of reason can the fœtal circulation be appealed to, as logical proof that the heart is the prime motor? Suppose we grant for a moment that the heart is the motor; let us see what duty is assigned it: beginning, then, at the heart, the blood is distributed through the fœtal system, capillaries and all: thence it is driven to the placenta through a convoluted cord, from eighteen to fifty inches in length, through the placental capillaries back again through the same length of cord, to the fœtus: and on its arrival there, a large portion of the blood is distributed through the capillaries of the liver before it finally completes the circuit to the heart, so that in reality, the heart drives the blood through three sets of capillaries. A more preposterous proof of a proposition could not well be found in all the annals of reasoning. It being absolutely necessary, then, to provide some extraneous means to keep up the circulation, in all the wide domain of nature, no agent so simple and effective as heat, can possibly be found; it is the grand and powerful agent in every department of nature; it can throw out a tremendous volume of lava from Skaptar Yokul, ninety miles long, seven miles broad, and two or three hundred feet deep; it can bring on a hurricane, whose irresistible power prostrates the tallest trees; it can whirl a ponderous locomotive more than a mile per minute:—but yet, in the human system, it cannot move a pound of blood, nor even expand it!!

This theory, then, satisfactorily to my mind at least, explains the fœtal circulation and structure of the placenta. I hope "Justicia" will attentively consider the case of the pulseless infant, p. 346, Oct. No. of your Journal—pulseless for upwards of two hours, the right ventricle cannot contract according to the ordinary theory, for want of nervous energy, and that it cannot get, for the brain is stupefied by the venous blood, the brain cannot get arterial blood because there is no power to propel it

to the brain; the left ventricle cannot contract, for the arterial blood is yet in the lungs and will not move without some power to move it, and as he will not admit the blood is expanded by heat and moved in the lungs, it must stay there until he can find some power to get it to the left ventricle.

Dr. Byrne presents, to my mind, a singular view of the circulation; he first has the heart the great motor, and knowing well it could not be made to harmonize with the laws of fitness in mechanics, because of its insufficiency, Prof. Draper's theory is brought in to explain the circulation through the capillaries; and we have the heart propelling the blood *downward* in accordance with gravity; and the arterial blood by its affinity for the walls of the capillaries, driving the venous blood before it *upward* against gravity, so that it is in reality a greater motor power: for the heart can only drive the blood downward, while this affinity for the walls of the capilliaries drives the venous blood upward against gravity. I have very serious objections to Prof. Draper's theory; in the first place, it cannot be considered sufficient to explain the fact that *all* the blood is found after death in the venous system: the blood in life fills out the arterial and venous systems, now if the person is slowly asphixiated, just as the blood becomes more and more venous, of course the affiity for the walls of the capilliaries becomes less and less, and yet while the person is dying, there is the greater need of this power to crowd the blood into the venous system, and we find the theory failing just when the power is most needed; the blood is incompressible (water is incompressible), and yet must be crowded into the venous system. Can this astonishing affinity of the arterial blood for the capiliaries be reasonably urged, when we know that the blood is nearly altogether venous, and gradually becomes much more so until death? If we will say the blood has been considerably expanded by heat, its contraction upon cooling will rationally explain how the whole of the blood can be crowded into the venous system at death: so that the more we examine the theory, the more it is found to harmonize with and explain facts. In the next place, we have venous blood propelling the arterial in the pulmonary circulation, while the liver is left to take care of itself, there the venous has to propel venous blood, or be propelled by this *vis a tergo* or power in the rear: and when we come to examine what is meant by this power in the rear, we find it means the affinity of the arterial blood for the walls of the capillary vessels.

In order to help the heart out of its difficulties in carrying on the circulation, an auxiliary is provided that is far more powerful than the heart itself: for that extraordinay affinity

not only propels the blood through the capillaries, which he admits the hart cannot do, but more extraordinary still, it drives it upward against gravity through two sets of capillaries, namely, those of the mesentery and liver; just about as reasonable as to conclude that the wheels of a wagon are the prime motors, while the horses are merely auxiliaries.

In the third place, it has the affinity of the oxygen of the air for the carbon of the blood, which is so moderate, that the clot of venous blood cannot be promptly and thoroughly changed to arterial while the air is in actual contact. It makes, I say, this affinity so strong that (though there is a membrane interposed in the lungs) it will move at least one quarter of a pound of blood; for, before the left ventricle can contract it must be filled, the left auricle and the pulmonary veins, and the large veins of the lungs must also be filled and the blood in them moved: one quarter of a poind, therefore, would be the most moderate calculation that could be made of that quantity of blood. An affinity not strong enough to prevent arterial blood from assuming the venous hue, though the air is in actual contact with it, strong enough to move a quarter of a pound of blood and probably more! *Credat Judaeus Apelles non ego.*

Allow me to remark, in reference to my supposed contradiction, concerning the agency of the nervous system that I was writing for the profession, and, of course, supposed them to be well acquainted with it, and did not wish to dilate unnecessarily. The precise agency of the nervous system in keeping up animal heat, I presume not to explain, for it is utterly beyond the ken of mortals. We can neither see, hear, smell, taste or feel it, and until provided with a sixth sense for that express purpose, we can never take cognizance of its *modus operandi*.

All we can do, is to notice the influence of the nervous system on the functions of animal heat, circulation and digestion, and with that, almost all are familiar whether physician or patient.

I hope no one will suppose, because I do not undertake to explain at length, how the nervous system operates in keeping up animal heat, that I take a merely chemical view of the subject, and reject the agency of the nervous system altogether: though I cannot for a moment suppose, that the prime source of animal heat is anywhere else than in the lungs, yet I am willing to admit that the nervous system plays an important part. For instance, we all know that intense anxiety or grief will cause cold, clammy hands and feet, even in warm weather, and that the bright prospects of realizing warmly cherished

hopes will keep them warm in cold weather; but, concerning the manner of its accomplishment, I must beg leave to be excused from wasting words on such an incomprehensible subject. In truth, I might discard the idea, that any heat is generated by the combination of oxygen and carbon, and admit that the nervous system alone is the source of heat, and there would be found in the lungs the same conditions that are found to exist under the other head. There would be the same vacuum in the lungs, the same conversion of a portion of the watery part of the blood into vapor, the same expansion of the blood, and the same driving of it out through the vessels provided, so that the opponents of the theory, gain nothing by attempting to prove that oxygen and carbon have nothing to do with animal heat. All we have to do is, to listen patiently to their arguments, thank them kindly for their trouble, grant that they are true, and then show them that heat is just as effective, whether generated from wood or coal—whether generated by the combination of oxygen or carbon, or by the nervous system alone, and still the theory is sustained.

In recapitulation, let us examine the style of reasoning on both sides :—

HERE IS A SAMPLE OF THE HYPOTHETICAL.

Young Gentlemen : Without my solicitation, the kind partiality of my friends has placed me in the chair of Physiology, and thus urged forward, I assume with pleasure the task of storing your minds with important truths.

I shall first take up the circulation of the blood.

All the muscles of which any material service is required, are attached to bones, which serve as levers and fulera; the heart is thus arranged, and, as it is a strong muscle, it is perfectly reasonable to conclude it can keep thirty-two pounds of blood in lively circulation; but what did I say, gentlemen—I believe I made a slight mistake; the heart is not thus arranged, but is "a rugged anomaly, a signal deviation from the laws of fitness in mechanics," and upon whose unfixed position it is awful to think ; but is nevertheless the motor power, as I can very clearly show by the following proof: The arterialized blood causes the heart to contract, therefore, the power is in the heart, and the stimulus of the blood brings it out. Your intelligent countenances, young gentlemen, show that your parents have not neglected the cultivation of your minds, and your polite behaviour shows

AND HERE IS A SAMPLE OF THE INDUCTIVE.

1st. The combination of oxygen and carbon produces heat.

2d. Said combination takes place in the lungs, ergo heat is generated in the lungs.

3d. Fluids expand upon the application of heat, and if they expand, they must move

4th. The blood is heated in the lungs, therefore it must expand, and must move.

The conclusion form the foregoing premises must be,that the heat generated in the lungs, is the motor power of the circulation.

5th. Cold reduces the circulation.

6th. Heat increases it.

7th. On the land, in the sea, in the air, in the earth, a universal law,other things being equal, the greater the power the greater the speed, holds good without a single exception whatever ; therefore, as the more heat there is, the faster the blood moves, and the less heat, the slower it moves, the unavoidable conclusion is, that heat is the motor power.

8th. From the laws of specific heat, water has the greatest capacity of all bodies for heat.

9th. A very large proportion of the blood, upon analysis, is found to be

that they have taught you, with equal care, not to ask impertinent questions, and for this I am truly grateful. Now, had any of you been so impolite as to ask me, by which one of the mechanicalpower the heart applied this force which the arterial blood brought out, I should have been in a "phix;" for, as it manifestly has not leverage sufficient, neither has it pully, wheel and axle,inclined plane,wedge or screw, I really cannot tell how it manages the business.

Thanks to the kindness of my father, my mind was early trained to soar aloft in search of scientific truths, and I must refer you for an answer to all such questions to the machine shop, as my business is to teach you physiology, and not mechanics. Having explained to you that the heart commences beating from the stimulus of arterialized blood, which causes it to contract, and bring out its power, I will now undertake to show you what causes it to stop.

"The cessation of the heart's action is due to two causes acting on the two sides; for, on the right side, it is the result of over-distension of the walls of the ventricle, owing to the accumulation of venous blood; and on the left, to deficiency of stimulus necessary to excite the movement;" or, just for short, so you will recollect it better, because the right side is too full and the left side too empty. That's as clear as mud, and you'll never forget it as long as you live.

I hope no one will ask who emptied the full side and filled the empty one, so that the heart ever started again, for I really cannot tell. My private opinion is, it was the man that struck Billy Patterson.

How the heart ever starts again without extraneous aid, hang me if I know enough of mechanics to tell; perhaps you may learn at the machine shop. If I had thought it would have been so hard to start again, I would have been more careful. I once saw a spotted gentleman in a circus, who held himself out of a window by the seat of his breeches to look at a procession, and, as he understands mechanics thoroughly, the first time he comes along, I will get him to show me how to start it again.

I will now undertake to elucidate M. Boinet's case. It is a case some thick-headed Willardian can't see into, but by the time I am done with it, he will be satisfied. The patient had been pulseless from the inhalation of chloroform for water; therefore, it is decidedly the best circulating medium to keep up the proper temperature

10th. From the large quantity of heat steam possesses, and the facility with which it imparts its heat to bodies colder than itself, it is the best medium for rapidly communicating the heat generated in the lungs.

The conclusion from the foregoing is, that, for the purposes of communicating heat to, and retaining it in the system, both vapor and fluid would be the best means.

11th. The analysis of the blood shows that not one of its constituent elements is near the point of saturation; therefore, if a small quantity of the watery portion of the blood be converted into vapor, there will be no deposit of superabundant salts under the laws of vaporization.

12th. Albumen is coagulated at 158°; the heat, therefore, of the body must never be near that point.

13th. From the great losses of caloric in the system, by heating the inspired air, by radiation from the surface, and by the evaporation of the perspiration, an immense amount of heat must be generated.

14th. From the laws of latent heat, steam produced in a vacuum at 67° would have just as much sensible and latent heat as steam produced in air at 212°. The animal economy, then, would derive precisely as much heat upon the condensation of that vapor, as if it had been produced at 212° in the air.

From the foregoing, it is very evident it would be best to produce that vapor in a vacuum.

15th. Anatomists teach that the lungs are in a vacuum, and that if air is freely admitted through an incision, the vacuum is destroyed, and death results.

16th. Surgeons teach that when air is admitted into the jugular vein, it rushes in and passes immediately to the thorax, with a peculiar SUCKING, GURGLING OR HISSING sound, such as we invariably hear when the air rushes into the vacuum produced by the withdrawal of a horse's foot from the mud and water, and as such a sound cannot possibly be produced by any other cause, the plain conclusion then must be, that the air was rushing into a vacuum in the thorax.

17th. Chemists teach that membranes are readily permeable by gases, while they are almost impermeable to air.

18th. Surgeons teach that if air is

upwards of five minutes, and was revived again by blowing air into her chest. If you will recollect that in the first part of my lecture, I showed quite clearly that the power was in the heart, and all it needed was a stimulus to bring it out, and that said stimulus was the arterial blood, you see, then, just as soon as M. Boinet blew air into her lungs, it arterialized the blood, and away it went to the heart and stimulated it to act; but how it ever got there, I don't think is my look out. In the early settlement of Kentucky, a traveler described the land as so rich, the trees were only three feet apart, and the elk were so large the tips of their horns were ten feet apart How, then, asked one, did the elk get through the woods? Ha! replied he, that's their own look out, not mine. So say I, the power is in the heart, and the excitant is the arterial blood, but as to how it ever gets there, is the hearts look out, not mine.

The next point, gentlemen, to which I shall call your attention, is the expansion of fluids upon the application of heat. Chemists all teach that, but physiology and chemistry are two very different things, as I can very satisfactorily explain to you.

That blood is heated in the lungs I am bound to admit, but that it is expanded I am not bound to admit, and will not do so, for it will make an excellent match for that other rugged anomaly the heart; I therefore contend, that, inasmuch as the blood only receives the small and insignificant quantity of 197,477·3 degrees of heat in twenty-four hours, it can never be expanded beyond the loss of carbon it sustains; but what to do with the surplus of oxygen, Carpenter says is absorbed into the system, I really cannot tell. I have not studied book-keeping enough to tell which side of the ledger to enter it. I can't enter it on the Dr. side, for the animal economy did not lose or expend it, and if I credit the carbon expended, by it, then the Willardians will have the advantage over me by 197,477·3 degrees of heat to expand the blood with, and I do not wish them to have even that little advantage. So, I guess I had better study book-keeping a spell longer; then I will know what to do with it, and will cheerfully inform you.

Another proof that heat has no influence on the blood is, that there is albumen in the blood, and it would be coagulated, and that, I think, is one of the strongest kind of proofs that this admitted into the veins, through an incision, death is speedy and inevitable; if, then, contrary to the law for the diffusion of gases, air should freely pass through the coats of vessels in the lungs, we should look for death to result with just as much certainty, as from its admission through a vein; the conclusion is, that air does not and cannot enter the vessels in the lungs, to come in contact with the blood.

19th. Chemists teach that water boils in a vacuum at 67°.

20th. Physiologists teach that the average temperature of the system is 98°; a reasonable conclusion is, as a very large proportion of the blood is water, that a portion of it may be converted into vapor, in the vacuum of the lungs.

21st. Chemists teach that one volume of water converted into vapor, becomes 1684 volumes; the conclusion would be, that these 1684 volmes of vapor would clear the track for themselves, by sending the the blood out through the vessels provided.

22d. Physiologists teach that great losses of heat occur by heating the inspired air, by radiation from the surface, and by the evaporation of the perspiration; therefore, the vapor generated, could not proceed far before it would be condensed again, and no inconvenience would be felt from over-distension.

23d. Carpenter teaches that the best means for recovery from asphyxia is the *alternate* application of cold and heat, precisely in harmony with this theory; and, as the leading thought in all the prescriptions for recovery from syncope, is to make the patient *catch her breath*, it would be best for all to lay aside the theory they *believe*, and adopt the one on which they *practice*.

24th. Carpenter teaches that, upon dissection, the pulmonary arteries are always found full, and the pulmonary veins are found empty; therefore, according to the laws of hydraulics, the motive power in a continuous tube must be between the engorgement and the vacuum, *i. e.*, in the lungs.

25th. Carpenter teaches that the suspension of the heart's action depends upon two causes; on the right side of the heart "to over-distension of the walls of the ventricle, owing to the accumulation of venous blood; and on left side to deficiency of stimulus necessary to excite the movement." Upon analysis, that simply means that the heart stopped, because the right side

"new-fangled notion" called the Willardian theory is nonsense. Does not every school-boy, who has had the pleasure of eating a boiled egg, know that the albumen is coagulated by the heat? and to his mind it would be perfectly clear, that if heat had any influence on the blood, we would be no better than so many hard boiled eggs. How much more ridiculous must it appear then, to philosophic minds like ours, thoroughly trained to sound logic. Listen to this irresistible argument—"the water of the blood is in close combination with its other constituents which would have to be boiled in order to boil the blood, and we know that boiling would act rather injuriously on albumen, fibrin, &c. But why waste time in logical reasoning on such an absurd theory, when you can have a practical proof of its fallacy? for all you have to do is, to notice, the first time you kiss a pretty girl, whether you feel the warm thrill from life, youth, and beauty, or the insipid, loathsome, repulsive taste of the coagulated albumen of a hard boiled egg. Take my word for it, young gentlemen, if you ever have the good fortune to kiss a pretty girl, you will never conclude the albumen in her blood has been coagulated by the application of heat, and with this triumphant argument I bring my lecture to a close.

I thank you, young gentlemen, for your polite attention, and shall recollect with pleasure how truly conservative you are. I hope your minds will never be led astray in search of any new-fangled "notions," but that you will recollect the time-honored precept of your venerable grandfathers—"Boys should never ask too many questions," is equally worthy your attention as young men.

In conclusion, I beg leave to inform you, that my next lecture will be upon the contradictions and vagaries of the Willardians.

was too full, and the left side too empty: the unavoidable conclusion then must be, that, if the heart once stops, it can never start again, for it is impossible, in accordance with the laws of mechanics, to start it again without extraneous aid.

26th. In Dr. Cartwright's famous alligator experiment, the circulation was re-established by artificial respiration and so effectually was it accomplished, that the animal had to be confined with ropes though the circulation had been suspended about half an hour.

27th. Of the same character is the following, from Hunter on the blood, p. 129. "A stoppage of respiration, produces a stoppage of circulation; and a restoration of respiration, produces a restoration of the circulation or heart's motion. Thus, in my experiments on artificial breathing, the heart soon ceased acting whenever I left off with my bellows, and upon renewing my artificial breathing, it in a very short time renewed its action; first by slow degrees but became quicker and quicker, till it came to its full action.

28th. If, in slaughtering animals, the trachea is cut so as to admit blood, scarcely any hemorrhage results; while, if that is left untouched, full hemorrhage occurs. By the Willardian theory this fact is readily susceptible of explanation: the blood filling the trachea suspended respiration, and, as a matter of course, the impelling power of the blood was suspended also, and the hemorrhage ceased.

When the trachea was not cut respiration went on and kept up the circulation of the blood, until the animal was nearly exsanguineous; the motive power kept the apparatus in motion until the waning powers of life gave way.

And now, in conclusion, tell "J.," if he will not go hand in hand with me, to patch up his crutches and try again. I know no pleasure like that of analyzing and investigating, and it delights me exceedingly to trip up such an unwary logician. There are five points I desire to see clearly elucidated by him, or some other "heart" man, and if they are, I will submit at once; and, that there may be no misunderstanding, I will state them clearly:—1st. Carpenter stopped the heart because the right side was too full, and the left side too empty. Now, I

wish to know when the heart started again — who emptied the full side, and who filled the empty one, so that it could work. 2d. I wish to know how the newly arterialized blood got to the heart when M. Boinet inflated her lungs? 3d. I wish to have tha alligator and Hunter's experiment explained. 4th. I wish to have the 28th section of this article elucidated. 5th. Why are the pulmonary veins empty after death?

Any man who can *logically* answer these questions, in harmony with the theory that the heart is the motor power, will display such extraordinary powers of reasoning, that I shall be delighted to take lessons under him in logic.

I am in hopes "J.," upon sober second thought, that I will see the beauty and harmony of this truth, and adopt it with *earnestness*, for, with such a lever, science can go forth, in the beautiful language of Dr. Denny, to "destroy Death's emissaries, confine him to his chambers, make him the most humble servant to mankind, only to open his doors to such as may strike at them with the knocker of old age, and admit them most obediently through the only entrance to the throne of truth."

Respectfully,

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NOTE.

(Accidently omitted in page 43, close of second paragraph.)

During the eruptive fevers, measles, scarlet fever &c., a large portion of the skin is inactive, and especially is it so, after they are over, while it is desquamating: if large portions of the skin desquamate at the same time, or if the process is unusually prolonged, severe consequences result, and oftentimes more severe than the disease itself; hence the almost absolute certainty of the development of tubercles where there is the slightest predisposition to them. A plain indication then, in the treatment of the eruptive fevers, is to have the patient frequently sponged from head to foot, so as to keep as much of the skin as possible in good working order during the progress of the disease, and subsequently, to remove the dead cuticle which obstructs the newly formed subjacent skin. The inactive state of the skin during the eruptive fevers and the subsequent desqamation is too frequently overlooked, hence so many fatal cases and cases ending in consumption, dropsy, chronic diarrhea, &c.